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ECONOMIC GEOGRAPHY

APRIL

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Dorothy C. Janis

CLARK UNIVERSITY, WORCESTER, MASSACHUSETTS, U.S.A.

OUR CONTRIBUTORS

Dr. White, Professor of Geography at Stanford University, California, is the author of many textbooks and articles in the field of geography.

Dr. Taylor, Professor of Geography at the University of Toronto, is the head of the first Department of Geography to be established in Canada. For some years he has been collecting material in the field of urban geography, and he has in the past written many textbooks and articles.

Mr. Rees has recently completed a monograph on the Expansion of Northeastern London since 1770, which is intended for post-war publication. At the present time he is a research student at the London School of Economics.

Dr. Balk is editorial assistant of ECONOMIC GEOGRAPHY. She received her doctorate in geography from Clark University in 1944.

Dr. Freeman, Acting Professor of Geography, Indiana University, is on leave from Eastern Washington College of Education, where he is Professor of Geography and Head of the Department of Physical Science. Several of his articles have appeared in recent issues of ECONOMIC GEOGRAPHY.

Major General Schley is a graduate of the United States Military Academy and of the Engineer School of the United States Army. He has traveled extensively by land and air in Mexico, Central America and the Caribbean, and South America.

Mr. Mead was engaged in graduate study in economic and historical geography at the London School of Political Science when the war interrupted his studies. He is at present with the R.A.F. in England and has had occasion to be in Iceland since his last article *Three City Ports of Denmark* appeared in the January, 1942 issue of ECONOMIC GEOGRAPHY.

Miss Janis received her A.B. degree at Western Michigan College of Kalamazoo where she majored in Business Administration and Economics with a minor in Geography.

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URBAN FUNCTIONS

CITIES serve manifold functions in the economy and culture of a people. All cities have some functions in common; all cities have some functions that are peculiar to their site and situation, to the people whom they serve; and all cities have some functions peculiar to their development and their history; hence cities may be classified more effectively on the basis of their functions as criteria than perhaps according to any other attribute. Size, ethnic composition or occupational activity of their people, topographic location, and accessibility, have formed bases for the grouping of cities for particular purposes.

Cities represent coöperative enterprise in multitudes of man's relationships, and enforce community planning, community enterprise, and community achievement on a scale that involves the freedom of security of hundreds, thousands, or millions of folk according to the variety and magnitude of the functions they serve. In cities, security and comfort prevail at expense of liberty and individual choice. In cities, conventions and formalities required for easy and safe social intercourse transcend self-reliance and independence of action. Cities imply regulation and regimentation, voluntary or enforced.

Established, assured security, in all its political, economic, and social manifestations, as provided by enlightened, popular democratic government, may eventually permit substantial decentralization of cities, but there will always remain other important functions that the city must continue to serve, that will require permanence and stability of urban life for all time to come. Cities serve indispensable functions.

ECONOMIC GEOGRAPHY

VOL. 21 APRIL, 1945 No. 2

IS THE TWENTIETH CENTURY SOUTH AMERICA'S?

C. Langdon White

WHILE travelling in South America in 1914, Theodore Roosevelt said, "I believe the present century is the century of South America." The substance of this statement has been reasserted countless times by business men, engineers, industrialists, missionaries, newspaper correspondents, politicians, teachers, transportation experts, traders, travelers, and others who have forecast that within the century South America would repeat the industrial triumphs of the past century in Europe and the United States. With its immense area, contrasted terrain and climates, great variety of natural resources, and its relatively small population (Figure 1), South America indeed appears to be a land of opportunity.

In the interim—1914–1944, billions of dollars have been invested in the exploitation of such resources as minerals, forests, soils, grasslands, and in manufacturing, transportation, communication, and urban improvements. Medical science has attacked the so-called "tropical diseases" and has made astounding progress. Moreover, education and sanitation have moved forward—rapidly here, slowly there, and in many places not at all.

Thirty years have now elapsed since the Roosevelt pronouncement. Is the twentieth century yet South America's? Does it bid fair to be? Before answering these questions, it should be realized that the attainment of such status depends upon three sets of conditions:

(1) The character and will of the people,

(2) The resources at their command, and

(3) New and changing world conditions.

THE PEOPLE

There is no generalization that categorizes all of the peoples in South America, for the continent is not a unit. The peoples of some countries are largely white, in others mostly Indian. In some the *mestizo* is outstanding, while in giant Brazil, the white man predominates in one part, the Indian in another, the *mamaluco* (offspring of a union of Portuguese and Indian) in another, and the Negro in still another (Figure 2). These people differ, not only in the color of their skin, but also in their degree of wealth and poverty, in their economic interests, and in education and degree of opportunity. Throughout most of South America, the Negro and the Indian have little of the world's goods. Even the *mestizo*, although considered socially superior to the Indian, actually enjoys few more amenities of life and is much nearer to the Indian way of life

than to that of his Spanish conquerors.

No factor throughout South America works against progress more than the ignorance and poverty of the masses. An almost unbelievably high degree of illiteracy characterizes the entire mountain backbone and most of the *selva*, jungle, and savanna areas. Millions of Indians occupying the mountainous countries do not even know that they are Bolivians, Ecuadorians, or Peruvians. Millions cannot speak Spanish; many know Spanish but do not use it unless circumstances force them to do so, so deep is their hatred of the Spaniard. Their language is Quichua or Aymara—native languages which to this day are *unwritten*. By this barrier of illiteracy, the Indians are shut off from communication with the ruling class of their own countries and from knowledge of the outside world. (Willard W. Beatty, "Walls between Americans," *Asia and the Americas*, Vol. XLIII, Nov., 1943, p. 620.) The numerical strength of these people in the three Indian countries is indicated by the fact that they comprise about 54, 50, and 45 per cent of the populations of Bolivia, Ecuador, and Peru respectively. (Alberto Arca Parró, "Census of Peru, 1940," *Geographical Review*, Vol. XXXII, January, 1942, p. 15.)

Too many North Americans believe that South America's great cities typify the nations in which they are located. Nothing could be farther from the truth. Cities constitute but the facade. In several of the South American countries, non-urban Indians outnumber whites.

When the Spaniards conquered the Indians, they took possession of them as well as of their land, treating them as "wild game would have been treated in the transfer of a European landed estate." (Willard W. Beatty, *Ibid.*) A further complicating factor was the system of land-holding—*latifundia*. Great estates owned by white men prevail almost everywhere. (Carl C. Taylor, "Land—Ownership and Status in Argentina," *Land Policy Review*, Vol. VI, Summer, 1943, pp. 25–30.) In the predominantly white countries, for example, Argentina, tracts exist running into thousands of acres and, until recently, were seldom divided into small farms and distributed among the immigrants. These wealthy land owners are conservatives who wish to continue their nations' "colonial status" as producers and *exporters* of foodstuffs and raw materials and as *importers* of manufactured goods. For the most part they are hostile to industrialization. The growing urban middle class, on the other hand, wants protective tariffs and manufacturing. In 1924 the Argentine economist, Alejandro E. Bunge, declared that this was the last generation of importers and ranchers (*estancieros*) and that the next generation would consist of farmers (*granjeros* or *chacareros*) and manufacturers. (Alejandro E. Bunge, *La economía argentina*, Buenos Aires, 1928.)

Even in the predominantly Indian and *mestizo* countries, the bulk of the arable land is included in the white men's estates. The relationship of the Indian to the land obviously varies from country to country but in one respect it is identical—*the Indian possesses but a fraction of his native heritage.*

Until the standard of living of the masses can be materially bettered, the twentieth century cannot be South America's. Improving the lot of the masses will contribute more than anything else to South America's stability, for "the man who has nothing is a good subject for revolution and socialistic propaganda, (whereas) the man who owns property wishes peace and order." Yet in many of the countries the miserable working and living conditions of the

masses make these people ripe for political violence. It is true also that most of these people have little contact with money economy: they sell little and buy little.

For generations the entire continent of South America was said to lack a middle class. Many authorities still maintain that there is an "absence of a middle class as we know it in the United States." Certainly those countries which have little or no immigration or which offer little opportunity for change in the social and economic structure, have none today and give little promise of having one in the future. The so-called "white countries," on the other hand, definitely have a middle class. Argentina has the largest middle class in all Latin America. Comprising perhaps one-third of the population, it embraces a wide economic range from professional and business men to ill-paid clerical workers in commerce and industry. A very large share of this middle class consists of foreigners. Chile, Brazil, and Uruguay too are making progress in this respect. It is significant that the rise of a middle class and of manufacturing go hand in hand.

There is also the matter of the distribution of population. The high mountains, the tropical forests, and the alternately wet and dry savannas are but thinly settled. After four centuries more than 80 per cent of the population of South America lives within 200 miles of the seacoast (Figure 1). Only the fringe of the continent, due largely to the paucity of transportation, has ever really been brought under control by the white man. Less than one-fifth of South America lies within twenty miles of a railroad. This goes far to help one understand the backwardness of the continent's industrialization. *Wherever over the earth great manufacturing nations have evolved, transportation has been well developed.*

Finally, regardless of race or status and regardless of country, the majority of the people south of the Rio Grande are agricultural and pastoral in their economic interests. Among the educated and well-to-do there has been a traditional aversion to business. The majority of the people prefer to produce food and raw materials rather than to engage in manufacturing and the background even of most of the white population is non-industrial. Many recent refugees do have an industrial background—knowledge of the type that enabled Europe to do a thriving business in exports of finished merchandise. This point, however, ought not to be

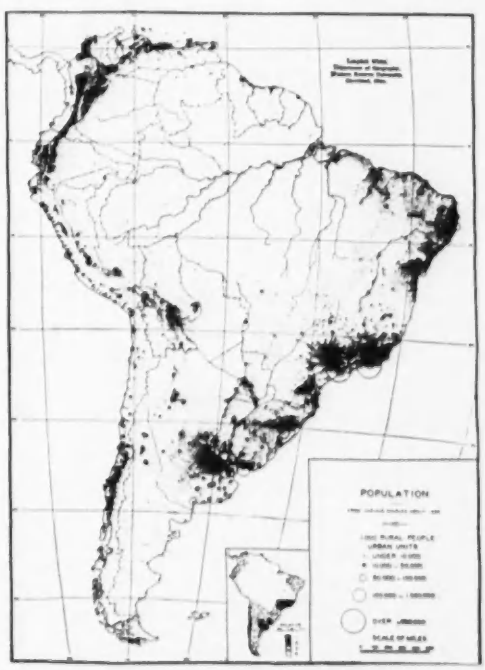


FIGURE 1.—Distribution of South America's Approximately 88 Million People. The bulk of the population lives in clusters—relatively small pockets either along the coast or on the Andean Plateau. For the most part these clusters are separated one from another by thinly occupied territory. Each cluster tends to be an economic unit with its own urban core. This pattern is typical of countries that are underdeveloped industrially. (Map by Preston James. Courtesy of the University of Chicago Press.)

pressed too far in the light of recent Japanese and Russian industrial triumphs. Also the almost unanimous testimony of foreign executives is that South American workers display a decided aptitude for factory operations.

THE NATURAL RESOURCES

Forests: The forests of South America are world famous, and are potentially of inestimable value. In the Amazon Basin, it is claimed that there are 20,000 species of trees—hardwoods and soft woods. There are millions of *hevea brasilensis*, the original and still the best source of natural rubber; *timbo*, which yields the valuable rotenone; cinchona, source of quinine, and many others. The jungles of Brazil, Colombia, Venezuela, Ecuador, Peru, and Bolivia contain rosewood, ebony, and mahogany. Ecuador is the world's principal source of balsa, the strong, feather-weight wood, used in the manufacture of war planes, rafts, and life preservers. Scores of balsa rafts daily move down the Guayas River to Guayaquil. Argentine and Paraguayan forests supply quebracho, one of the world's chief sources of tannin. Over considerable areas in southern Brazil grows the Paraná pine—a splendid commercial soft wood.

Despite the fact that South America has more than half of the Western Hemisphere's forest land, it actually produces only about three to five per cent of the hemisphere's total cut, Anglo-America supplies the bulk. Consumption of lumber within South America has been small indeed, and strange as it may seem, our South American neighbors have long depended upon the United States and Canada for part of the timber they use. The reasons for this are first, that the Europeans who settled in the New World were accustomed to the so-called soft woods—pine and spruce—for construction purposes and, second, the cost of getting local timber has been very high in most parts of South America. Furthermore, a large part of the forest area contains hardwoods which do not grow in pure stands. Where the wood is heavy (some logs weigh as much as 70 pounds per cubic foot), the general lack of transportation discourages exploitation.

To be sure after this war, Europe will need much timber and South America, especially if it can devolve a system of felling most of the species in a given stand, should be able to supply much of this. But exports of lumber and even utilization of lumber in South America itself can contribute little in the way of making the twentieth century South America's.

Minerals: South America has been called a vast storehouse of mineral wealth. Together its countries have so many minerals that when listed, they read like a table of contents in a metallurgy textbook. Space makes impossible a detailed treatment of these minerals but an effort is made to emphasize the situation in those most indispensable to man.

In *petroleum*, South America is most fortunate, production taking place on both the Atlantic and the Pacific Coasts, but mostly from fields along the east front of the Andes. Petroleum experts speak of a petroleum belt extending from Venezuela to Argentina's Patagonia. Venezuela ranks second among world producers and is the world's largest exporter of oil. Colombia, Peru, Ecuador, and Argentina also are of international importance.

It is in *iron ore*, however, that South America is particularly favored. Brazil, Chile, and Venezuela all are endowed with important resources. With an estimated one-fourth of the world's iron ore, Brazil possibly leads all other countries. Although deposits are present

in nearly every state, it is in Minas Geraes that they occur in greatest quantity: 1,500,000,000 tons of hematite with more than 65 per cent iron; 3,000,000,000 tons of ore with 50 to 60 per cent iron; 10,000,000,000 tons of low grade ore with 30 to 50 per cent iron. (United States Department of the Interior, Bureau of Mines. "Mineral Resources, Production and Trade of Brazil," *Foreign Minerals Quarterly*, Vol. 4, July, 1941, p. 17.) In Chile, high grade ore from El Tofo near La Serena is mined and then exported to America's great tidewater iron and steel industry at Sparrows Point, Maryland. Venezuela's large deposits of high grade ore, located in the interior near the Orinoco, no doubt like Chile's ore, will be exported, for it is "widow ore"—that is, it lacks the coking coal which, with iron ore and limestone, forms the basis of the metallurgical industry.

In *copper*, Chile ranks second in world output, while Peru and Bolivia are also important producers.

So far as *lead* and *zinc* are concerned, metals required by the industrial world in great abundance, South America has no deposits of major importance, although some is mined in Peru and Bolivia.

In *bauxite*, the ore of aluminum, Dutch and British Guiana rank high in world production, but they make little use of it locally. Low cost electric current is needed to make aluminum (about 20 times as much energy as for iron) and while it may be that South America could meet this condition, the fact is that the bauxite is shipped to the United States and Canada.

In *tin*, only Bolivia is a commercial producer. But her ores are complex, low-grade, and difficult to treat; and her mines are poorly located in high mountains where transportation charges are heavy. Moreover, coal for smelting is lacking. The concentrates have hitherto been refined in the United Kingdom, where, because of their complex character, they were smelted in conjunction with Malayan ore. The war has resulted in the smelting being done in Texas City, Texas.

In the alloys of iron, South American countries as a group are well endowed. Especially is this true as regards manganese, chromite, antimony, and vanadium. Brazil is reputed to have the world's largest manganese deposits, although it is not the world's foremost producer; Brazil also has chromium. Chile, too, is a producer of manganese. Bolivia leads the world in output of antimony. Peru has the world's largest vanadium mine high up in the Andes.

In this presentation of minerals, little was said about coal. Unfortunately, South America is exceedingly poor in coal—producing less than one per cent of the world's supply and possessing less than one per cent of its reserves. When it is realized that more than one-half of the world's work is performed by coal and that our southern neighbors as a group have both an inadequate quantity and an inferior quality, the relative lack of industrialization there is more easily comprehended. What coal there is, is located primarily in Colombia, Venezuela, Peru, Chile, and Brazil. (Mr. Courtney De Kalb, former editor of the *Mining and Scientific Press* of San Francisco, California, did exploratory work in the territory between Peru and Colombia. He reports seeing innumerable large outcrops of coal on the north bank of the Putumayo River and said that in his estimation they constituted the largest undeveloped coal area in the world.)

Despite what may seem to the average traveler to be a super-abundance of mineral wealth, any "belief that South America is a vast reservoir of untouched

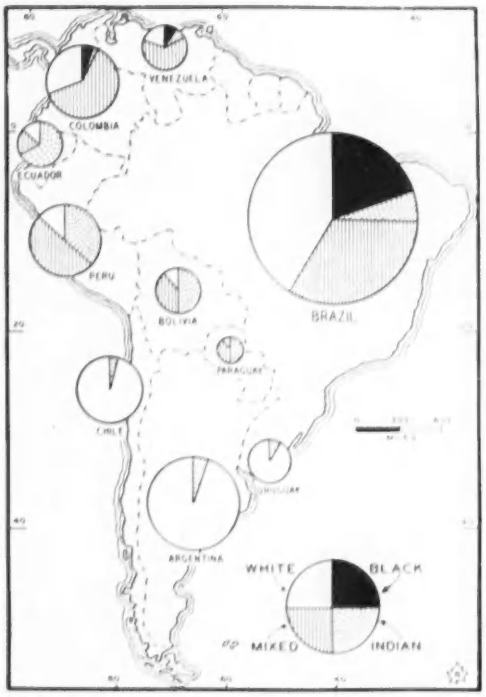


FIGURE 2.—Approximate Composition of the Population of South America. Note that only the three southern republics are predominantly white. (Based on a map from *Survey Graphic.*)

mineral wealth is wholly illusory." (H. Foster Bain and T. T. Read, *Ores and Industry in South America*, New York, Harper and Brothers, 1934, p. 358). Commercial deposits are not abundant and what minerals do exist are frequently badly located—that is, they lie in high mountains and plateaus which impose all but insuperable difficulties to the building of railways, the cheapest known means of transporting heavy commodities by land.

NEW AND CHANGING WORLD CONDITIONS

Conditions are changing the world over. It is certain that the South American countries no longer wish to be exploited. They have seen so little reward go to their people from resource exploitation that they are readily influenced by attacks against foreign capital. Investigations have pointed out time and again how low the wage scale is, and how inadequate are safety precautions.

But this is only part of the picture. As previously noted, minerals are located in mountains, where a paucity of transportation facilities exists. The denser populations, however, are in the lowlands around the periphery of the continent. To develop these resources and move them from the mines, expensive railways must be built. This requires capital. Until recently little capital could be raised in South America. There is little doubt that ample capital will be forthcoming when circumstances are propitious for the establishment of new industries. (See George Wythe, "The New Industrialism in Latin America," *Journal of Political Economy*, Vol. XLV, April, 1937, p. 223.) Bain and Read state an angle of this problem seldom understood by people not intimately associated with mining—that great chances have frequently had to be taken and small profits received by foreign corporations. For example, the Cerro de Pasco Copper Company invested 25 million dollars, which was drawn from *outside* Peru, and waited fifteen years before a single dividend was paid. This enterprise was begun on what most geologists would have considered a highly speculative estimate. It meant building a railroad 80 miles long, locating and developing coal deposits, building an expensive smelter at Oroya, and solving numerous problems of unusual difficulty, because of the nature of the ores, the remoteness of the locale, and the high altitude. All these hurdles, however, were successfully negotiated.

When Latin Americans and Anglo-Americans blame large mining companies for the fact that South American nations are primarily exporters of miner-

als, they fail to realize that it is not so much because of the avarice of the foreign corporations but because Nature did not endow these countries with coal for smelting and refining the minerals. To be sure, local centers of industry are developing here and there on the basis of waterpower, petroleum, low-grade domestic coal, and even imported coal, but probably these never will compete seriously with the "power belt" of the North Atlantic, which possesses more than 90 per cent of the world's pig iron and steel capacity. (C. K. Leith, J. W. Furness, Cleona Lewis, *World Minerals and World Peace*, Brookings Institution, Washington, D. C., 1943, p. 49.) Regardless of what has been said to the contrary, all investments have not been for exploitation in the bad sense of the word and all profits have not accrued to absentee landlords.

South America's growing industries: Our southern neighbors are generally regarded as producers of food and industrial raw materials. Yet some of them *are* growing industrially. When World War I cut off South America from many normal sources of supply and when the depression, which followed in its wake, sharply reduced markets for the agricultural and mineral products, the development of local industries became imperative. South America began making at home many of the products formerly obtained abroad—especially those items essential to living.

South American manufacturing is characterized by the lighter branches, those making mostly consumer goods—textiles, meat, flour, sugar, wines, shoes, cigarettes, cement, furniture, candles, soap, paper, glassware and pottery, paints, electrical appliances, chemicals, tires, and the assembly of automobiles. Argentina, Brazil, and Chile lead in manufacturing, but only Brazil appears to have all the bases for successful large-scale industrialization—great size, abundant raw materials (Figure 3), huge water-power resources, fair to good transportation facilities in the better populated areas, stimulating climates in the plateau, ample labor, and a large market (half the population of South America).

FIGURE 3.—Minerals of Brazil. This nation has a greater variety of minerals and larger reserves than any other South American country. Most of the minerals lie in the Brazilian Highlands, which extend from near the mouth of the Amazon to the extreme southern part of the country. Despite the great variety of minerals and despite the large reserves and the high quality of many, mining is not as important as it should be. This is explained by the large number of intersecting streams which make railway construction difficult and costly, the nationalization of mining which virtually precludes ownership in mines and industry by foreign companies, the reluctance of Brazilian capital to risk investment in mines, and the paucity of experienced mine managers and engineers. (Map from *Mines and Minerals in Brazil* by Josias Leão, 1939.)

The United States and Europe, however, did not achieve their great industrial reputations by developing *light industries;* they built up impressive concentrations of *heavy industries.* Because of its usefulness and its low cost, 50 times more steel is used than of any other metal.

Unfortunately, South America is relatively unimportant in the manufacture

of iron and steel (Figure 4). The combined capacity of all the countries south of the Rio Grande is 1,400,000 tons of steel or only a little more than that of Sweden, and Sweden ranks *eighth* among European producers (Russia omitted). ("Steel Capacity in Latin America Being Built Up to 1,400,000 Tons," *Steel Facts*, November, 1943, p. 4.) Brazil, with its new $50,000,000 plant at Volta Redonda in the state of Rio de Janeiro, is the leader in South America. Until recently little use was made of her huge reserves of ore estimated at 15 billion tons with a metallic content of 50 per cent or more.

Argentina, lacking coal and having very meager reserves of iron ore, is not equipped to produce pig iron from ore but does make some steel. This is because steel-making is not limited to a region in which iron can be made from ore. Steel may be made by utilizing scrap and a variety of fuel materials. Argentina produces only about 65,000 tons a year.

FIGURE 4.—Distribution of the Metallurgical Industry and of Iron Ore and Coal in South America. Despite enormous and rich deposits of iron ore, South America (even Latin America) does not seem destined to play a prominent rôle in the world's iron and steel industry. Principal reason is the paucity of ample deposits of coking coal. Most of the plants shown on the map are of only local importance. Where coal does occur, it is invariably far removed from the iron ore. (Map based on one from *Steel Facts*.)

THE OUTLOOK

In the foregoing pages it has been pointed out that an overwhelming majority of the people of South America have an agricultural and pastoral heritage and hence have not until recently been greatly interested in manufacturing; that while South America has minerals, the continent is not a vast reservoir of untouched mineral wealth; that topography imposes Herculean burdens upon the profitable production of minerals; that the immense iron ore resources of Brazil and the great, but less impressive ones, of Chile and Venezuela must, *so long as present metallurgical methods prevail*, be developed mainly for export; that without large and high-grade coal deposits *heavy industry* cannot progress far; that at present the entire continent with a steel capacity of about 800,000 tons makes a poor showing compared with the 88,570,000 tons of the United States, the 24,700,000 of Germany, the 21,800,000 of Russia, and the 20,600,000 of the British Empire; that all the countries are still in the early stages of industrialization, making products that require relatively simple processes. It is not anticipated that the type of rapid industrialization which characterized America's Midlands (Pennsylvania, Ohio, Indiana, Illinois), England's Black Country, Germany's Ruhr, and Russia's Urals can be repeated anywhere in South America. Even Brazil, with the brightest future, gives no indication of becoming another United States, Ger-

many, Russia, or England. To be sure, manufacturing everywhere throughout the continent will increase materially, but it will be essentially in consumer goods. Stimulated by autarchy and perhaps by necessity, local industry will be protected, but only when subsidized to the extreme will South American industries be able to withstand in normal times the competition of the mass units in the United States and Europe.

South America, then, seems destined for some time to continue its past and present rôle of exporter of food, of agricultural, pastoral, and forest products, and of minerals. She seems to have no claim on the twentieth century in the sense that Theodore Roosevelt prophesied—the development of primary (heavy) industries and of those secondary industries they nourish. There is, of course, the possibility of a new type of industrialism based upon a technology that we cannot conceive of today. Perhaps the blast furnace may some day be eliminated; perhaps low-grade coal may be coked or perhaps even petroleum and hydroelectric power may be utilized for smelting iron ore. Plastics or something else may displace steel as man's greatest ally among the usable metals.

TOWNS AND TOWNSHIPS IN SOUTHERN ONTARIO

Griffith Taylor

AS the title of this paper implies, my purpose is to discuss townships and towns, their evolution, and the relations between them. Coming from Australia the very term "township" was rather unfamiliar to me; and at first I imagined that here, as there, it connoted a "village"—something smaller than a "town." On the contrary in Ontario—as in the United States—it may be roughly defined as an area of land, usually about a hundred square miles, which has been plotted on a map with a view to the ready subdivision of the area into small blocks for settlement. The township is thus, in a sense, the surveyor's approach to settlement, rather than the pioneer's; though it is drawn expressly for the benefit of the latter. The townships over large areas were determined long before any settlers occupied them. There were half a dozen methods of cutting up the land into such townships, and these are briefly described in the paper.

In the early days it was hoped that the new settlers would develop *towns* on rational lines, upon certain designated blocks in the respective township areas. Such early "town-planning" was almost wholly abortive, though some indication of it appears in a few Canadian towns. On the other hand, the road-pattern was determined by the universal "checker-board" plan of the township, and the pioneer village was in most cases very directly determined by the intersections of these checker-board roads. The district of Whitby is discussed to illustrate the relation of town to township and county. In some cases, as at Stratford, the town plan is primarily based on *radial* roads, which form the limits of somewhat irregularly arranged townships. Here a more logical town-plan developed, as it were, by accident. However a few towns in the early days, such as Goderich and Galt, were blessed with founders who could see beyond the immediate needs of a cluster of rectangular farm-blocks. They are briefly described.

For many years, indeed, since my early association with Canberra, I have been trying to analyze the controls affecting city growth; and I have developed a general theory of such evolution, which I label the "Seven Ages of a City." Most occidental cities slowly pass through such stages, which I have named from analogy with topographic evolution "Juvenile," "Mature," "Senile," etc. The relation of the metropolis of Southern Ontario (Toronto) to the surrounding portion of the province, leading ultimately to a true Regional Plan, is discussed in the last section, which will appear in the next issue.

Early Settlement

By the provisions of the Canada Act of 1791 the Governor or Lieutenant Governor was authorized to create districts, towns, and townships. It is the character of the latter area with which this Section is at present concerned. The first system of land settlement in Canada was that of the French Seigneury. The explorer, Frontenac, built a fort at Cataraqui (Kingston) in 1673, and later La Salle added a stronger

fort, and also started stations at Niagara (1678) and Detroit. The French pattern near Detroit is illustrated in Figure 1 at 1. But the conquest by the British in 1759–60 changed the pattern of settlement almost entirely.

The instructions to Governor Murray as regards Lower Canada stated that townships were to be laid out which "were to contain about 20,000 acres each, having as far as possible natural boundaries extending up into the country, and comprehending a necessary part of the River St. Lawrence." In the most convenient part of each township there were to be town plots (Figure 1 at 5), as close as possible to navigable water. In 1779 settlement was begun along the Niagara River in the vicinity of the fort, as a means of supplying the needs of the garrison. In 1781 the first survey of the district above the Ottawa River was begun, and by 1784 some ten thousand of the United Empire Loyalists had reached Upper Canada. At first these blocks were called "seigneuries" or "fiefs," not "townships."

About 1788 several regiments had received grants; the non-commissioned officers getting 400 acres and the privates 300 acres each. About this time Southern Ontario was divided into four districts; named, in consideration of the large German element among the United

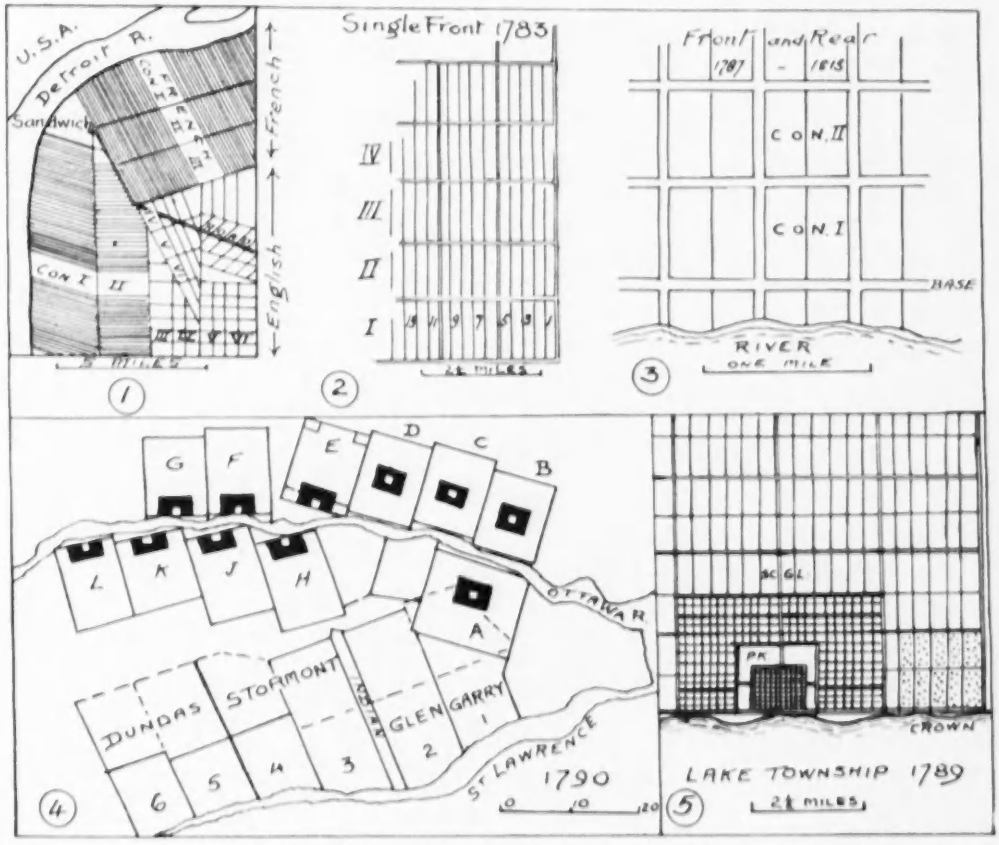


FIGURE 1.—Sketch maps illustrating early methods of subdividing new lands. At 1, the French and English systems are contrasted near Windsor. At 2, is the Single Front and at 3, the Double Front method of subdivision. At 4, the suggestions for town plans along the Ottawa River are sketched. At 5, such a town plan is enlarged. School Gleb and Park are indicated. (Based on Fraser, Whitson, and Schott.)

Empire Loyalists, Lunenburg, Mecklenburg, Nassau, and Hesse. The method of holding the land now gradually changed from the French to the British practice. A Land Board gave a certificate to a satisfactory applicant, and within two days after this was in the hands of the local surveyor he was to assign a lot of about 200 acres, giving also a signed description of it.

The "town plots" in each township measured one mile square; and usually, if an inland township, were situated in the centre. If a water township, they were in the middle of the water front (Figure 1, at 4). Each town plot was laid out on a prescribed plan, with town-lots of one acre, town-parks of 24 acres, and squares and streets of stated dimensions. The Crown reserves in the corners of the townships consisted of eight farm lots each. It is a pity that none of these projected towns ever materialized. (Charlottetown in Prince Edward Island is one of the few large towns, which still shows something of such an original plan.) When a body of immigrants decided to settle on a block of new land, surveyors were dispatched to establish the baseline of the township—usually parallel to the lake front. This done, a second line parallel to it was run at about one and a quarter miles to the rear, followed in due course by similar parallel lines at the same intervals. These lines were termed "concessions," —a term also used for the areas between the parallel lines.

The allowance for roads was usually sixty feet along the first concession, and forty feet along the succeeding lines. The farm lots along these concessions approximated 200 acres in area, having a frontage of about 80 rods (440 yards) and a depth of 400 rods. At intervals of two or three miles, a space of 40 feet between lots was left for a side road running at right angles to the concessions. Usually the baseline was more or less parallel to the waterfront, and the lots were at right angles to the waterfront (Figure 1, at 2). This explains the remarkable pattern of the blocks of lots in Ontario, and explains the presence of triangular "Gores" between the main patterns. A good example of a Gore is to be noticed just west of Toronto in the vicinity of Etobicoke.

Prior to 1791 the settlements were confined to the upper St. Lawrence, Quinte, Niagara, and Detroit, for no grants had been made near Toronto, Long Point, or to the south of the Thames Valley. At this time the total population was under 25,000. In 1793 Quebec was divided into Upper and Lower Canada, and the method of tenure in Upper Canada was made much the same as in England. In July 1792 the province had been divided into 19 Counties, which extend along the waterfront from Glengarry in the east to Kent in the extreme west. Usually the counties were two or three townships wide. At the same time the boundaries of the four districts were revised and they were renamed Midland, Home, London, and Western (Figure 1, at 4).

By 1798 much more was known of the province, and a number of changes in the major boundaries followed. Russell and Prescott were marked out as new counties along the Ottawa River, while Niagara and the Western District were further subdivided. "Thus it was hoped that no settler in the province would be at a greater distance than an easy day's journey from the local centre." (Fraser, A. Land Settlement in Upper Canada, 1921.)

The early history of the district near Whitby illustrates the procedure about this time. William Willcox from Cork secured a grant of 200 acres for himself, and then arranged for a settlement by himself and associates in a township of

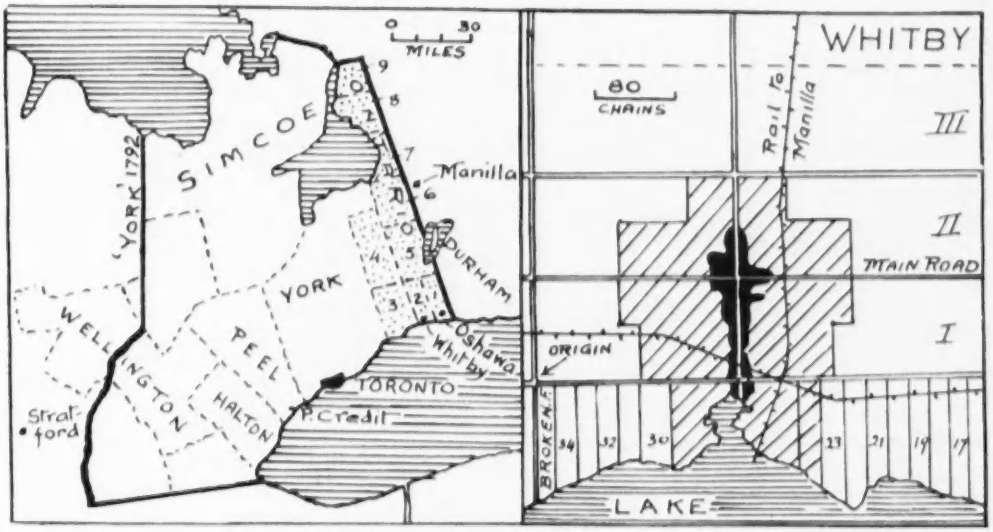


FIGURE 2 (left).—The limits of the original County of York (1798) and the limits of the modern County of Ontario (dotted). There were eight townships in Ontario (1852), but Whitby was divided in 1857.

FIGURE 3 (right).—The Town site of Whitby (diagonal ruling) as given in a map of 1877. The concessions and lots of the Township are shown. The black patch shows the area occupied by houses in 1940.

1,000 acres. Large grants were to be allotted to the four leaders and 200 acres was to be given to each settler he could induce to settle at Whitby. In 1795 he collected 33 settlers in Ireland, but on his return journey most of them abandoned him and settled in the United States. Finally in 1795 he reached Ontario and as compensation 1200 acres each were allotted to his wife, three daughters, son, and son's wife on condition of residence within the province. Such grants to "associated companies" were given up about 1797.

Yonge Street and Dundas highway were built about 1795 by a group of Rangers under the command of Simcoe. These roads were primarily designed for military purposes, but naturally greatly helped to open up the country. Indeed north of Eglinton Avenue, Yonge Street became the base-line of the townships to the north. In July 1794 the plan for the town of York was approved. Each person occupying a town lot was required to build a house on it within three years, or forfeit the patent. By the end of the year there were about 70 families in the vicinity of the projected town. For a time it seemed likely that London on the Thames would replace Newark (Niagara) as the capital of Upper Canada, but in 1797 York was made the permanent capital.

Various attempts to found towns occurred in the last few years of the century. The most important of these early settlers was Colonel Talbot, and since his experience illustrates one of the early methods of opening up Ontario, a few words may be devoted to his history. In 1803 he received an officer's quota of 5,000 acres in the township of Dunwich on the shore of Lake Erie to the south of London. It was agreed that for every family he settled on 50 acres in the township, he was entitled to receive 150 acres for himself. For 35 years Talbot engaged in settlement, and he placed some 30,000 settlers permanently on the land. By 1824 he had control of 28 townships, which contained

some 50,000 people by 1837. He acted quite independently of the Government, but as a result of his energy, the London and Western Districts became flourishing settlements with good roads, long before most of the rest of southwest Ontario. He retired after a most successful pioneer career in 1837.

The most ambitious attempt to develop Ontario by private funds was the settlement of the Huron Tract (between London and Goderich) and of adjacent areas near Galt and Guelph. The Canada Company purchased about two million acres, and John Galt, the Scottish novelist played a major part in their development. In 1827 the town of Guelph was founded, and a brief description of its interesting plan follows (Figure 4). The road to Goderich was cut through the forest from Guelph in 1828. By 1838 Guelph contained a population of nearly 2,000; while the Huron Tract to the northwest had received some 4,500 settlers.

The following table gives the amounts of land granted in the early years of settlement. The figures refer to thousands of acres.

EARLY SETTLEMENT (AFTER FRASER, A. LAND SETTLEMENT IN UPPER CANADA)

Year	*1798*	*1799–1800*	*1801*	*1802*	*1803*	*1804*	*1805*	*1806*	*1807*	*1808*
Area	1170	178	479	605	438	253	138	140	244	180

The Allotment of Land

The various systems of subdividing the lands of southern Ontario were as follows. The "Single Front" System was used in the earliest days, in which the Concession lines were surveyed, and roads were planned along these (Figure 1 at 2). About every fifth lot it was proposed to make cross roads, and the lots were about five times as long as they were broad. The "Front and Rear" System followed from 1787 to 1813, and in this cross roads were planned around each two lots (Figure 1 at 3). This method was used chiefly in the Niagara Peninsula, and led to a costly network of roads which was expensive to build and maintain. The "Double Front" System (ca. 1818) followed, in which the concessions were much narrower, so that the east-west roads were closer together. Cross roads were made every five lots, much as in the first method. The next system was the "2400 acres Section" type, in which alternate concession-lines became roads, and the side roads were placed about six lots apart. This gave blocks of twelve farms between the roads, each comprising about 200 acres.

The Canada Company around 1835 cut their land into somewhat similarly arranged blocks, but there were 10 farms of 100 acres each in a section in this case. About 1850 in the Ottawa-Huron region there developed the "Six Mile Township" system. In this case four square farms formed a section of a square mile, and there were 36 such sections in a township. Some five per cent of the area was reserved for roads which bordered each square section. The corners of the sections were carefully surveyed, and many of the errors of the earlier surveys were obviated.

Whitby Township and Town

The diagram of the Whitby district given in Figure 3 will help to make clear the early procedure in planning a town in Ontario. The surveyor was the

first official to appear on the scene, in this case before 1800. He marked a line parallel to the lake front, which became the southern boundary of Concession I. Thus he cut off from the main survey the irregular lake frontage, which was known as the "Broken Front." A road was laid out along the south of the first Concession, but in the case of Whitby this did not become the main road of the little town, which ultimately developed between Concession I and II. The concessions hereabouts were laid down 100 chains (220 yards) apart. Since the surveyor approached the area from the east, the southeast corner of each township was in general the datum for marking numbering the lots. In Figure 3 the datum (or origin) of the next township to the west (that of Pickering) is indicated, but the datum for Whitby was about ten miles to the east, and does not appear in Figure 3. The lots were about 25 chains wide, with a depth of 100 chains, and those in the "Broken Front" (numbered 16 to 35) are labelled in Figure 3.

According to the Ontario County Atlas of 1777 (Beers, Toronto) the town site occupied a series of lots symmetrically arranged about the main road leading from the little port on the Harbour to the north. It comprised 16 full lots and eight half-lots. No suggestion of parks is apparent, though such appeared in the older plans elsewhere, as shown in Figure 1 at 5. No doubt to the early settlers, when the total population was only a hundred or so, such foresight seemed unnecessary. In the case of Whitby, perhaps it was; since only a very small portion of the 20 lots of the town-site has been actually used for close-set houses. This latter area is shown by the black patch in Figure 3. The original farm lots, with a frontage to the main roads of 25 chains (1650 feet) were cut up into shop blocks or town blocks, which as usual would have a frontage of 50 to 100 feet, or even less.

The relation of town to township and county can be well illustrated by the evolution of the little town of Whitby—the first town to the east of Toronto. York was the fourteenth county to be proclaimed in July 1792, and was originally much larger than its present area, since it extended west to the headwaters of the Thames River. In the early days it was part of the "Home" District, and had its centre at York (Toronto). In 1821 the county of Simcoe was cut off from the northern part of York county; and further agitation led to the creation of the county of Ontario in 1852 (Figure 2). Since this county is bound up with the growth of Whitby it may be briefly discussed.

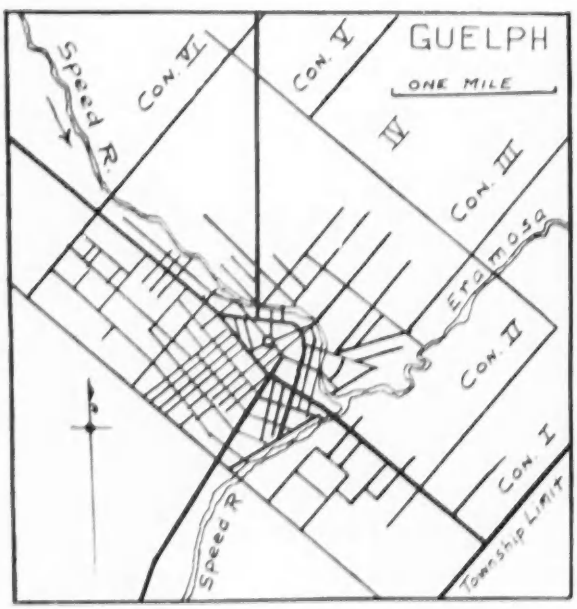
The township of Whitby was surveyed between 1791 and 1795, and originally also included East Whitby Township. Hence we see that townships as well as counties were subdivided as population increased. A Vermonter named Wilson settled in Whitby in 1794, and was the sole settler for several years. In 1804 Lynde's house was said to be the chief residence between Kingston and Toronto, while two other settlers had a house on the lake front nearby. A log schoolhouse was in use by 1811. By 1821 there were settlers as far back as the third Concession. A fulling mill was built a little to the east at Oshawa as early as 1822. The old township of Whitby was subdivided in 1857, and Oshawa (the chief town in the new East Whitby township) is now much larger than the older settlement of Whitby (Figure 2).

An energetic individual—Peter Parry—moved into the district in 1836 from the eastern part of the Province. He succeeded in developing a main road running north, to link Whitby with the interior, after the manner of Yonge Street. He also advocated separation

from York County, but died in 1851 just before the separation took place. In the "Historical Sketch of the County" (1877) we find the following statement: "Had he been spared ten years longer, the great railway from Whitby to Georgian Bay would have been built; and in all probability Whitby with its fine harbour and surrounding advantages would be today a city rivalling in wealth and importance the City of Toronto." Its population around 1870 was about 3,000 and today is about 4,500. The main purpose of the split from York County was said to be due to their desire to work out successfully their own local concerns, untrammelled by the overwhelming centralizing influence such as they had to contend with in the City of Toronto (Beers).

Planned Towns of Galt and Goderich

A brief description of the efforts of the Canada Company to open up the region north of the Thames basin in southwest Ontario has already been given. The town of Guelph was surveyed about 1827, and is one of the very few examples of town-planning in Ontario. The Speed River makes a large bend where the tiny Eramosa River enters from the east. The latter occupies one of the numerous broad post-glacial channels, among the till and drumlins of this district. On the flat in the bend, at an elevation of 1100 feet above sea level, the surveyors laid out the central streets of the future city (Figure 4). The essential features are the central square and the radial streets leading to the river bank at this point. Thus they kept in mind two of the major principles of town planning, which have been ignored in almost all the other "checkerboard" towns. The shopping centre and the chief public offices are still situated in or near this centre, which can be approached directly from the outlying areas, by the numerous radial streets, from every angle of the compass. It is



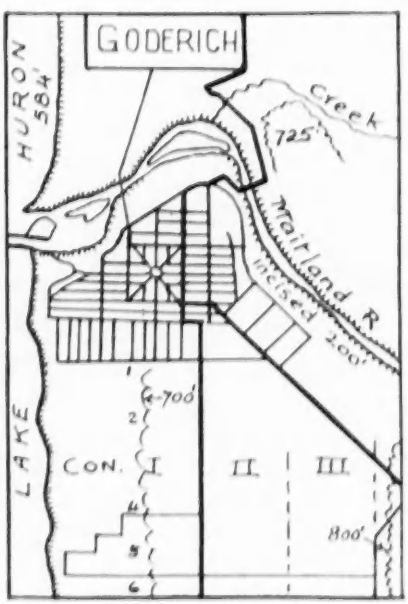


FIGURE 4 (left).—A somewhat simplified road plan of Guelph, to show the radial streets in the centre of the town. Note the early concession areas.

FIGURE 5 (right).—A somewhat simplified road plan of Goderich, to show the "octagon" with eight radial streets in the centre of the town. A few contours are indicated.

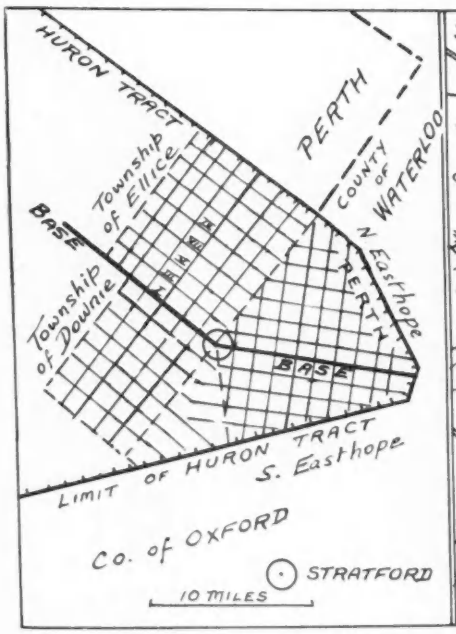
true that in the outer portions of Guelph the streets are based on the rectangular Concession lines, determined by the baseline which forms the "township limit" to the southeast of the town. Nevertheless Guelph has a plan better suited to town conditions than almost any other Ontario town.

Goderich is well known for its definite plan, which is illustrated in Figure 5. It lies at the western end of the main road through the Huron Tract, just as Guelph lies at the eastern (Figure 4), and was laid out in 1827. At the entrance of the Maitland River into Lake Huron the river has cut down some 200 feet into the Devonian formation, giving rise to interesting "incised meanders" along the river. There is a steep cliffed shore to the lake rising for 100 feet, and then flattening out to a gentle slope between the 700 and 800 feet contours. Upon this almost level ground in the bend at the mouth of the Maitland, John Galt located the new settlement. A central "octagon" was laid out (later surrounding the Court House) with eight radiating streets; and shops soon occupied the outer edge of the octagon. The whole area was bounded by four streets forming a square with each side 600 yards long (Figure 5). Four of these radiating streets are appropriately, if not poetically, named North, South, East, and West streets. Lauriston tells us that in 1839 practically all the business of the town centered about the harbour below the hill, or on the lower part of West Street overlooking the harbour, while below the hill stood a string of residences. Already there was a foundry and a boat-building plant; and a tavern stood where the large flour mills are today. About 1866, men drilling for oil on the banks of the lake struck the saline layers of the Devonian formations, and thus inaugurated one of the earliest salt industries in Canada. In 1890 Goderich began to handle grain from the prairies, and now there are several large flour mills in operation. Many vessels use the port for trade or as a winter harbour of refuge. Today its population is about 5,000.

In Figure 5 it is seen that the Concession areas start from the lake shore, which here runs north-south; that is, there is no "Broken Front." The Concessions inland are a mile wide, with main roads between them. Two of these north-south roads are indicated in the south east corner of Figure 5. The east-west roads were surveyed at one and a quarter mile intervals, and there were five lots in each rectangle so formed. The method of subdivision in the first block south of Goderich is indicated for Concession I in Figure 5. It is to be noted that the plan for Goderich did not extend beyond the central block of streets already described. Beyond that the streets belong to the orthodox gridiron pattern, where the surveyor rather than the planner was the authority responsible.

Stratford and Its Radial Streets

One of the most interesting little towns in southern Ontario from the point of view of town-planning is Stratford. Its plan, in a somewhat simplified form, appears in Figure 7. Here we see the little artificial lake named after Queen Victoria, which has replaced the typical mill pond on the Avon River. Parklands fringe the lake on both sides, so that for a small town Stratford ranks high among its peers. But it is the radial plan of the streets which is of chief interest. No less than five main streets, from five different directions meet near the former mill dam, giving a very convenient approach to the shopping centre and the public offices of Stratford. Who planned this little town? To a con-



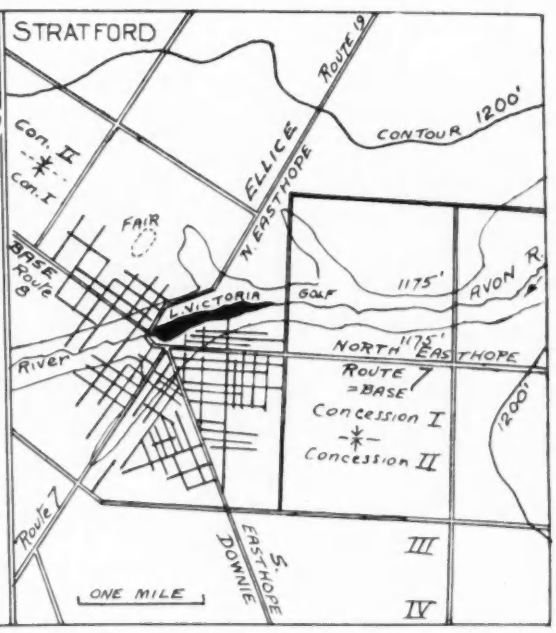


FIGURE 6 (left).—The east end of the Huron Tract showing the boundaries of four townships. Stratford grew up at their common junction, shown by a circle.

FIGURE 7 (right).—A simplified road plan of Stratford showing the main roads based on the irregularly arranged townships. Note that here the two main roads were the bases for subdivisions.

siderable extent it seems to have gained its radial pattern by accident.

The Huron Tract was surveyed as a vast triangle between Guelph and Goderich. The road from Guelph to the west crossed the Avon hereabouts (Figure 7) so that it was a natural focus for a small settlement. (This road is now used by routes 7, 8, and 19.) It became the base for the township areas in the vicinity, so that the two Easthope townships were laid off to the east of this natural focus, and Ellice and Downie Townships were surveyed to the west. Owing to the changing direction of the road, and to the triangular shape of the Huron Tract hereabouts (Figure 6) the roads between the various concessions meet at the oblique angles already mentioned.

In January 1829 the first surveyor, J. MacDonald, reached the site of Stratford. The rough road had been cut through the forest before this date, as mentioned. In December of the same year the first settler—S. Fryfogle—located Lot 14 on Concession I, and built his hut there. Hence the road came first and determined the baseline, then followed the township survey, and the earliest settler was still later. This is rather typical of early Ontario. The population increased very slowly and aggregated to 50 in 1841, but by 1850 it had grown to 900. Within two years the local residents were successful in their attempts to separate the county of Perth from Huron and Bruce, with the chief centre at Stratford. Two separate railways reached Stratford in 1856, and the public-spirited Park Board which gave to the town its lake and park commenced work in 1904.

It may be noted in conclusion that the boundaries of the counties of Perth, Waterloo, and Oxford are rather intricate to the east of Stratford. This is due to their conforming to the wedge-shaped eastern end of the Huron Tract.

EVOLUTION OF MERSEY ESTUARINE SETTLEMENTS

Henry Rees

At the time of the last British census of population (1931) there lived in settlements grouped around the estuary of the Mersey, a population of about 1,332,000. Even for the industrial North of England this is an unusually high figure. What are the factors which have led to such a high degree of urban concentration?

Before attempting to provide the answer it will, perhaps, be useful to state the problem more clearly by noticing briefly the nature of the Mersey estuarine settlements.

The City of Liverpool contained within its boundaries in 1931 a population of 855,500; its great industry is shipping; its waterfront of some five miles is completely occupied by docks, behind which are concentrated warehouses, factories and offices. The business quarter of the City consists of a small area around the Town Hall, which corresponds quite closely in extent to the Medieval town. On the outskirts of this zone are the public buildings, and beyond them appear eighteenth century streets. Much of the rest of Liverpool consists of congested nineteenth century development, but there is, however, a welcome fringe of public parks.

To the north lie Bootle, Waterloo, Seaforth, and Great Crosby. All are connected to one another and to Liverpool by continuous housing. Bootle, a County Borough, with a population of 76,800, continues along its waterfront the docks of Liverpool. An English County Borough is equal in status to a County—education, police, and highways fall within the jurisdiction of its council. The remaining northern suburbs, mainly dormitory towns for Liverpool, contain a population of about 40,000.

South of Liverpool is the comparatively modern L.M.S. Railway port of Garston, specializing in the large scale import of timber, ores, and fruit. Its population is 29,000.

Facing the Liverpool conurbation from the western shore of the estuary are the twin centres of Birkenhead and Wallasey. They are separated by Wallasey Pool, whose mouth has been utilized for dock construction. Both are County Boroughs, Birkenhead with a population of 147,900, Wallasey with 97,500. They are to a large extent dormitory towns for Liverpool, though Birkenhead has its own individuality, acting as the port for most of the export trade to India and the Far East. It contains well-known shipbuilding yards, while its southern suburb, the Borough of Bebington (pop. 26,700) contains a famous soap works located in Port Sunlight.

Some three miles south of Port Sunlight is the entrance of the Manchester Ship Canal, which has resulted in the emergence of several industrial areas along its banks.

Ellesmere Port is a specialized port of modern growth located at the point where the Shropshire Union Canal meets the Ship Canal. The Urban District, including Whitby, contains a population of 18,909; its industries are varied, including the manufacture of

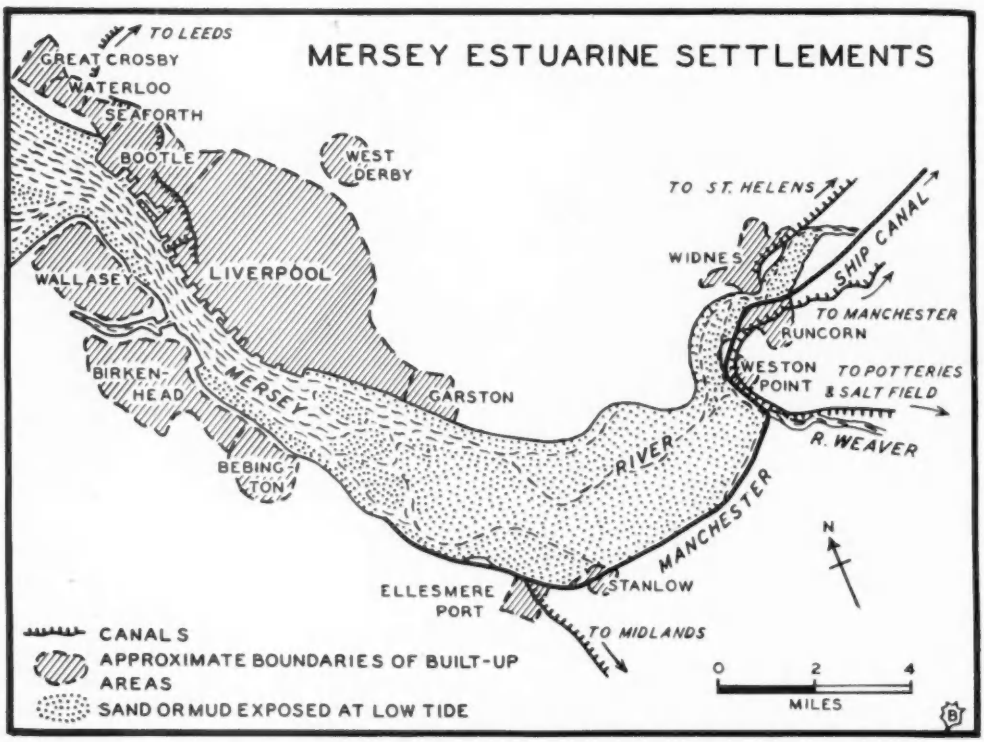


FIGURE 1.—Mersey Estuarine Settlements.

steel plates, building and construction, oil refining, and paper making.

Two miles eastward lies Stanlow, a specialized oil port, whose contribution makes Manchester one of the foremost oil ports of the kingdom.

Finally, at the eastern extremity of the estuary, are the twin towns of Widnes and Runcorn, facing each other across the Mersey. Widnes (pop. 40,600) is known chiefly for its heavy chemicals and soaps, while Runcorn, on the south bank, is more residential in character, and its industries are more varied, including iron foundries, tanneries, rope works, and chemical works. Runcorn, with its southern suburb, Weston Point, is, in addition, a canal junction for the Midlands; here the Manchester Ship Canal is linked to the Bridgewater Canal and to the Weaver navigation (Figure 1).

Some discussion of the physical setting of these settlements will be necessary in order to explain their growth.

The coasts in the region of Liverpool experience some of the greatest tidal ranges of Britain, a rise and fall of 27 feet six inches being recorded at Spring Tide. This fact, together with the configuration of the estuary, has produced an active tidal scour resulting in naturally deep water in the narrow estuary mouth. At all other points along the shore mud flats are exposed at low tide. There was thus no natural site for an estuarine port above Liverpool-Birkenhead until the head of the estuary was reached. Here the Mersey makes a loop to the south, impinging on firm ground, and providing deep water. At this point developed the town of Runcorn, while the north bank, lacking deep water, was yet bare of settlement.

Widnes, then, is the newer settlement, and the circumstances of its growth will later be noticed.

Deep water was not the only attraction of the Liverpool-Birkenhead site. On both sides of the estuary high ground approaches the water side; these plateau areas, rising to over 100 feet are related to outcrops of Triassic sandstone, and are no doubt, on account of their relatively resistant character, the reason for the existence of the "bottleneck." Much of this high land was dry and healthy, forming suitable sites for settlement.

Though the local conditions for settlement were favorable, eastward communications were severely hampered by wide areas of damp mossland, perhaps related to the formation of temporary lakes during a late stage of the Quarternary Ice Age. The growth of Liverpool is bound up with the progress of improvement of its eastern communications.

These, then, were the main physical conditions relating to the growth of the Mersey estuarine settlements. The progress of expansion of these settlements may now be examined.

Liverpool, now the largest and most prosperous of the conurbations, was for many centuries quite insignificant. It is not mentioned by name in the Domesday Book, being at that time a rural hamlet subsidiary to the manor of West Derby. The parent manor is now a village some four miles east of the waterfront, and rapidly in process of becoming part of the built-up area of Liverpool.

Not till the reign of King John (1199–1216) did the site acquire anything more than local importance. The King, seeking a port of embarkation for troops engaged in the subjugation of Ireland, planned a new burgh on an almost empty site. Seven streets were laid out, which have left their mark to the present day, and settlers were invited to people the new town. Liverpool thus began its urban life in 1207. Not until 30 years later was a castle constructed, and later still the town was surrounded by a wall. The precise site occupied in this way had considerable possibilities for defense. It was protected by water on two sides: to the west lay the Mersey estuary, to the east a tidal inlet, which can be picked out from the 1-inch geological map, as an eastward-stretching strip of alluvium. High ground between these two water barriers was dominated by the castle.

For several centuries the growth of the town was related primarily to military and naval needs. During the Scottish wars of Edward III, Liverpool was required to equip ships; later, during the Irish operations, the town was required to transport armies across the Irish Sea. Similarly, during the reign of Henry VIII, and still more, that of Elizabeth, Liverpool was in frequent use as the port for embarking armies bound for Ireland.

During the whole of the period the port authorities of Chester claimed dominance over the customs of Liverpool, a claim which was resisted by the Liverpool citizens with characteristic vigor. But the gradual silting of the Dee estuary was causing the trade of Chester to dwindle, while correspondingly increasing that of Liverpool.

Trade both by sea and land was improving. Slow and expensive though it might be, transport by pack horse was nevertheless developing along the only road—itself a poor one—linking Liverpool to the manufacturing centres of England. This road, followed the Prescot Ridge, which provided a dry route avoiding the mosslands to the north and south. Some coal arrived from Wigan; rough linens from Manchester and Kendal; woolens from Yorkshire; knives and scythes from Sheffield. These were exported to Ireland, and in

return, linen yarn, hides and sheepskins were imported.

The later history of Liverpool may be considered conveniently in two aspects: first the progress of the oversea connection; second, the development of its hinterland.

Certain dates may be quoted as specially significant in the development of the trade of the City. It had grown sufficiently to require an enclosed dock, and this, the first wet dock of the modern world, was opened in 1715, utilizing convenient land in the mouth of the old tidal creek. About this time the notorious slave trade began; by 1730 it was in full swing, and by 1750 London and Bristol were left far behind. Much of the prosperity of eighteenth century Liverpool was based on this sordid commerce, but it had the effect of paving the way for the legitimate trade in sugar and cotton.

Two other events were of importance in the development of the cotton trade: In 1793 the cotton gin appeared, which allowed the speeding up of production of raw cotton; in 1803 the United States acquired, through the Louisiana Purchase, vast new cotton-growing areas. These combined events resulted in a considerable expansion of the cotton imports into Liverpool.

Ten years later (1813) the monopoly held by the East India Company over the Indian trade was abolished; and the very next year Liverpool ships began trading in this new area. Thus was the opportunity provided for the later import of Indian short staple cotton and of oilseeds, and the export of coarse manufactured goods for the Indian market.

With the development of commerce came a corresponding development in the manufactures of the hinterland, and an improvement in land communications.

The details of the growth of the cotton and chemical industries and the rise of Staffordshire potteries need not detain us here. It need only be mentioned that from about 1770 onward cotton manufacturing rose to become the dominant industry of South Lancashire, and during that period the resources of the greatest saltfield in Britain began to be tapped, resulting in the establishment of a heavy chemical industry with its attendant manufactures, such as soap making, tanning, and paint and dye production.

Improved communications between Liverpool and these industries were clearly necessary. The existence of the surrounding mosslands has been mentioned. Apart from these areas much of the surface was formed of sticky boulder clay, quite unsuited to land transport. In these circumstances it was a matter not only of improving existing communications, but often of evolving quite new methods of transport.

In the first half of the eighteenth century improved road communication was achieved to Manchester via Prescot and Warrington. The Douglas, Weaver, Mersey, and Irwell Rivers were deepened for navigation, and the first canals of the modern world were constructed. Many have now out-lived their usefulness, though some supply water to the cotton mills; the Weaver navigation is, however, important for the transport of salt to the chemical areas, and of kaolin to the potteries of North Staffordshire (Figure 2).

Following the canal age came the railways. The first passenger railway in the world (1830) was designed to improve transport between Liverpool and Manchester. By driving an embankment directly eastwards its engineers for the first time overcame the barrier of Chat Moss. A railway system arrived, linking Liverpool to the cotton centres, but that too, is now largely

superseded for the shorter distances by modern motor transport. It is stated that in 1936 three quarters of the raw cotton delivered to spinners from Manchester and Liverpool, went by road, and only a quarter by rail. Until quite modern times, however, the only main road leading eastwards was the narrow and winding eighteenth century Prescot road. Recently the new East Lancashire Road has been constructed, skirting north of St. Helens and connecting with Manchester.

Before noticing the effect of the Ship Canal it will be convenient to consider briefly Birkenhead and Wallasey.

The first edition of the Ordnance Survey 1-inch Map (published 1840) depicts the beginning of the growth of Birkenhead. It was a planned town, with roads laid out in a rectangular pattern and containing several squares. Many of the streets in 1840 were not yet occupied by dwellings. One may hazard the guess that Birkenhead originated as the residence of the more prosperous citizens of Liverpool. At that time Wallasey was an agricultural

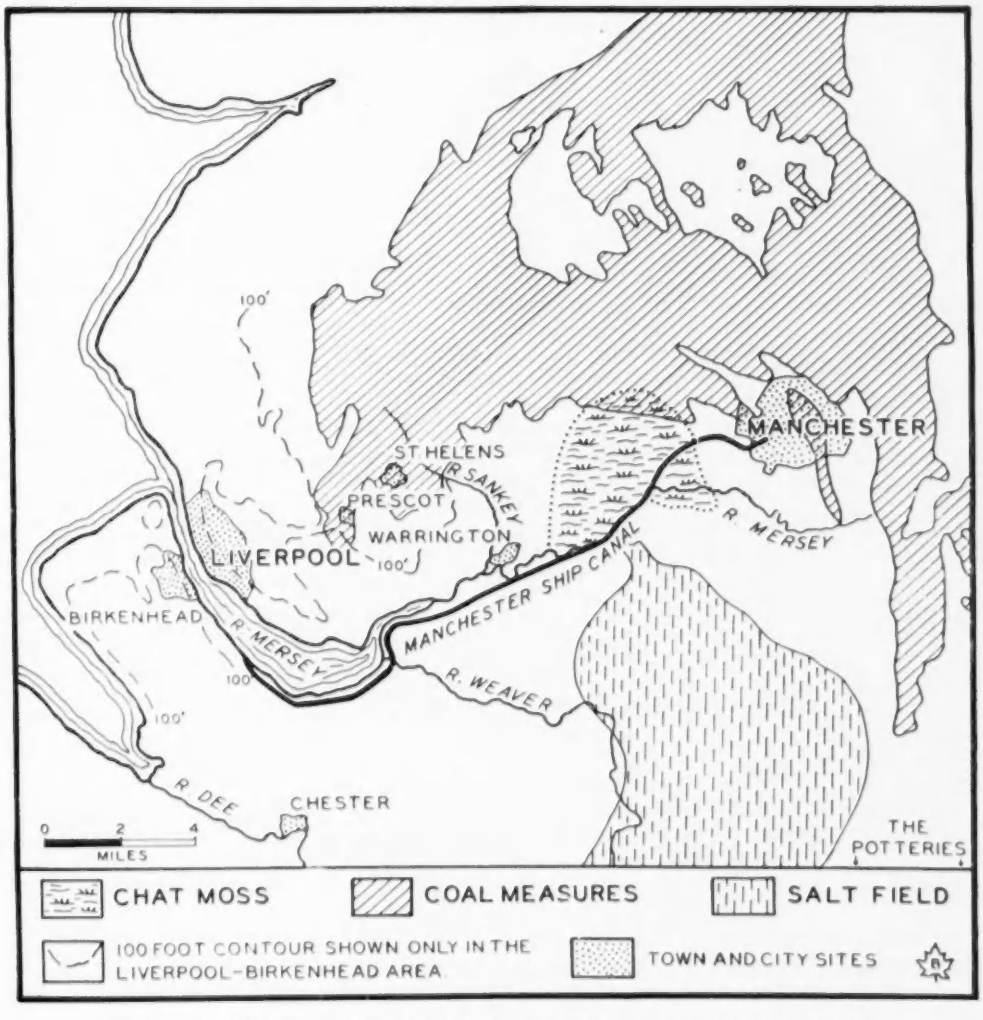


FIGURE 2.—Map to show some of the factors influencing Mersey-side growth.

village, linear in form, with few signs of expansion.

Between the two was Wallasey Pool, whose banks even in 1840 were occupied by two smelting works and a foundry.

During the following hundred years expansion was rapid. It may in part be regarded as an overflow from the opposite shore. It has been mentioned that both Wallasey and Birkenhead are to a large extent dormitories for Liverpool; to that extent their rise is explained by the same factors which apply to Liverpool. There are, however, local advantages for docks and industry. Wallasey Pool has provided convenient sites for dock construction, while the low-lying tracts bordering it and to the south of Birkenhead offer opportunities for industry which are absent from Liverpool. Here are found shipbuilding yards, iron foundries, flour mills, and the Sunlight Soap works. In contrast the industries of Liverpool occupy smaller areas and are connected almost entirely with its imports; hence the growth of oilseed crushing, soap and candle making (attached to the crushing mills), grain milling, and sugar refining.

The Manchester Ship Canal may now be considered. The canal was opened in 1894. Among its many effects has been the rise of a number of new industrial areas along its banks. Those falling within the estuarine area include Ellesmere Port, Stanlow, and Weston Point.

Ellesmere Port is of purely artificial growth. A hundred years ago there was little sign of habitation: the district was marshland, but at this point was the terminus of the Dee and Mersey Canal, later to be known as the Shropshire Union Canal. After 1894 the site acquired importance owing to its position on the new Ship Canal. Terminal docks were constructed, linking with the Ship Canal, wharves were erected and coal conveyors constructed, and by 1932 about twenty factories were established on the marshland, with plenty of room for expansion.

Stanlow likewise was uninhabited marshland in 1840. At this point a triangular peninsula extended to the north; after the construction of the Ship Canal, owing to its isolated position, the site was considered suitable for oil docks. In 1927 the lower four and a half miles of the canal were increased in depth from 28 to 30 feet in order to allow larger vessels to reach the oil docks. With storage capacity for 88 million gallons this port is one of the foremost in the kingdom.

Weston Point, Runcorn, and Widnes may be considered as a single group. It has been pointed out that the physical fact of deep water favoured the development of Runcorn. In 1840 Weston Point and Widnes were not settlements at all, but merely the names given to the termini of the Sankey and Weaver Canals respectively. The former led to St. Helens, while the latter connected to the Cheshire saltfield and the pottery district of North Staffordshire. At Runcorn terminated a third canal, namely the Bridgewater Canal, which led to Manchester.

The phenomenal growth of the chemical industry of Widnes is to be related to the proximity of Cheshire salt, to the existence of unusually good water communications, and to the extensive demand for soaps, dye stuffs, and bleaching material in the adjacent textile industries.

Not until 1850 was the first chemical industry—the Leblanc process—established in Widnes. The industry had been moved from St. Helens, chiefly on account of complaints of fumes, and it is easy to see that an uninhabited site would therefore be attractive.

The chemical industry was from the

first related to the needs of the textile industries, which presented a heavy demand for soap. Two chief raw materials are needed in soap manufacture, animal or vegetable fats or oils, and caustic soda. The first were imported through Liverpool, and it was to supply the caustic soda that the Leblanc process became established. By this process common salt is broken up into its constituents, including many compounds of sodium apart from caustic soda, compounds of chlorine (required in the textile industries for bleaching purposes), and the three heavy acids, sulphuric, nitric, and hydrochloric acids. These are some of the chemicals manufactured in Widnes, the whole industry having sprung originally from the needs of the soap makers. Apart from Cheshire salt, the Leblanc process requires coal, limestone, and pyrites. The first is obtained from the South Lancashire Coalfield, the Sankey Canal playing some part in its transport. Limestone arrives from Buxton (Derbyshire) and from North Wales; pyrites is imported mainly from Spain.

To conclude, if there is one factor which requires emphasis, it is the comparatively modern growth of so much of the Mersey estuarine settlement. A century ago Liverpool and Runcorn were the only established industrial centres, though there were, it is true, many agricultural villages dotted about the estuary area. Birkenhead had been but recently laid out; neither Wallasey nor Widnes had yet appeared. Finally where now are thriving ship canal ports there was nothing but barren, uninhabited marshland.

RURBANIZATION OF WORCESTER'S ENVIRONS

Helen H. Balk

WORCESTER is a city of 190,000 and is known as the Heart of the Commonwealth because it is situated very near the geographical center of Massachusetts. Founded in 1713, after two unsuccessful attempts at settlement, it served as a stopping place in traffic between the coastal towns, especially Boston and the Connecticut Valley towns, particularly Springfield.

For many decades Worcester remained a country town much like its neighbors and not much larger than most of them; but by the opening of the Revolutionary period it had already achieved a conspicuous leadership in population and importance. Before the end of the nineteenth century, Worcester had so far expanded within its own town limits that it was crowding upon its boundaries in several places, and had already developed almost continuously populated connections with its own outlying districts like South Worcester, New Worcester, Quinsigamond, and others. Upon the opening of the twentieth century its expansion began affecting appreciably and directly the growth of population of some of its neighboring towns and their suburbanization as satellites of Worcester had begun (Figure 1). The communities within Worcester town were all incorporated into the city at the time of its charter, in 1843 (Figure 2). Though the bordering towns actually became suburban additions to Worcester, as far as communications and density of population are concerned, they maintained their separate and distinct legal entity and village character.

No modern city constitutes within its corporate limits a complete self-sustaining unit, either socially or economically. There exists about every city, a local tributary region which regards and uses the city as shopping and amusement center, or place of employment. In this region the city finds its supply of fresh foodstuffs and seeks the diversion and recreation that the open roads and open places outlying countrysides afford and sites for country homes. The city limits are only arbitrary political lines, when modern transportation facilities are available; its economical and social limits are far beyond.

Physical Factors

Worcester lies in a niche of the edge of the Massachusetts Upland at the headwaters of the Blackstone River. All five tributaries to the Blackstone are broken by small falls which were used by the early settlers for water power to run grist and saw mills. The topography of New England lends itself to small scale farming. Early agriculture was first based on an ideal of self-sufficiency, but with the opening of the Erie Canal and the consequent pushing of the frontier westward to the prairies, small scale self-sufficient farming was no longer economically feasible for the New England farmer. New England turned to manufacturing not because she could not supply all the food required to feed her people, but because manufacturing yielded greater profits than cultivation of the soil. Persons who like to farm went West to take advantage of the easier

tillage, those who didn't like to farm went into the mills where they were assured of a steady income.

Climate.—Great variability and diversity are the most distinctive features of the climate of Worcester and its environs. The rapid succession of cyclones produces sudden and marked changes of weather every few days. Not only is the diversity from day to day great, but there is a wide range of temperature between summer and winter months (45 degrees F.) because of the location of the area on the east side of the continent.

Winters are severe and long; their usual length is six to seven months. Short periods of very low temperatures are interspersed with periods of higher temperatures. Spring is brief and differs from winter in that the periods when temperatures are low come less frequently and the mild periods become longer. Summers are hot and pass after a few brief periods of relatively high temperatures. Autumn is clear, crisp, and delightful. The length of the growing season on the average is 176 days, which is sufficient time for the maturation of various hardy crops.

FIGURE 1.—Location Map showing Worcester and its surrounding towns. W.—Worcester; H.—Holden; W.B.—West Boylston; S.—Shrewsbury; G.—Grafton; M.—Millbury; A.—Auburn; L.—Leicester; P.—Paxton.

The average temperature in February, the coldest month, is 24.3 degrees F. and the average temperature in July, the warmest month, is 71.3 degrees F. The average annual temperature is 47 degrees F.

The average annual rainfall is 40.78 inches rather uniformly distributed throughout the year, and the area has a high relative humidity. The average annual fall of snow is 58.9 inches. Frequent thaws in winter have a marked effect upon the passability of roads.

The location of Worcester in relation to latitude, in relation to the Atlantic Ocean and the resulting modifying influences in relation to the continental mass, and to the cyclonic storms of the prevailing westerlies, are consequent upon continental and marine influences. The variability and diversity of the climate are the result of these influences.

Topography.—Complexity of glacial feature characterizes the Worcester area. When the glacier (Wisconsin) which once covered the area, melted back, it left in the valleys the stratified materials which hid the true dimensions and form of the valley. The present rivers and brooks are now digging out the sandy and gravelly glacial deposits. On the hills the ice deposited a more or less heavy mantle of till forming numerous drumlins and drumlinoids, lending to the landscape its typical hilly aspect. Final melting of the ice left many boulders scattered over the surface and deep in the drift, boulders which added considerably to the labor imposed upon the early settlers to clear the land for cultivation.

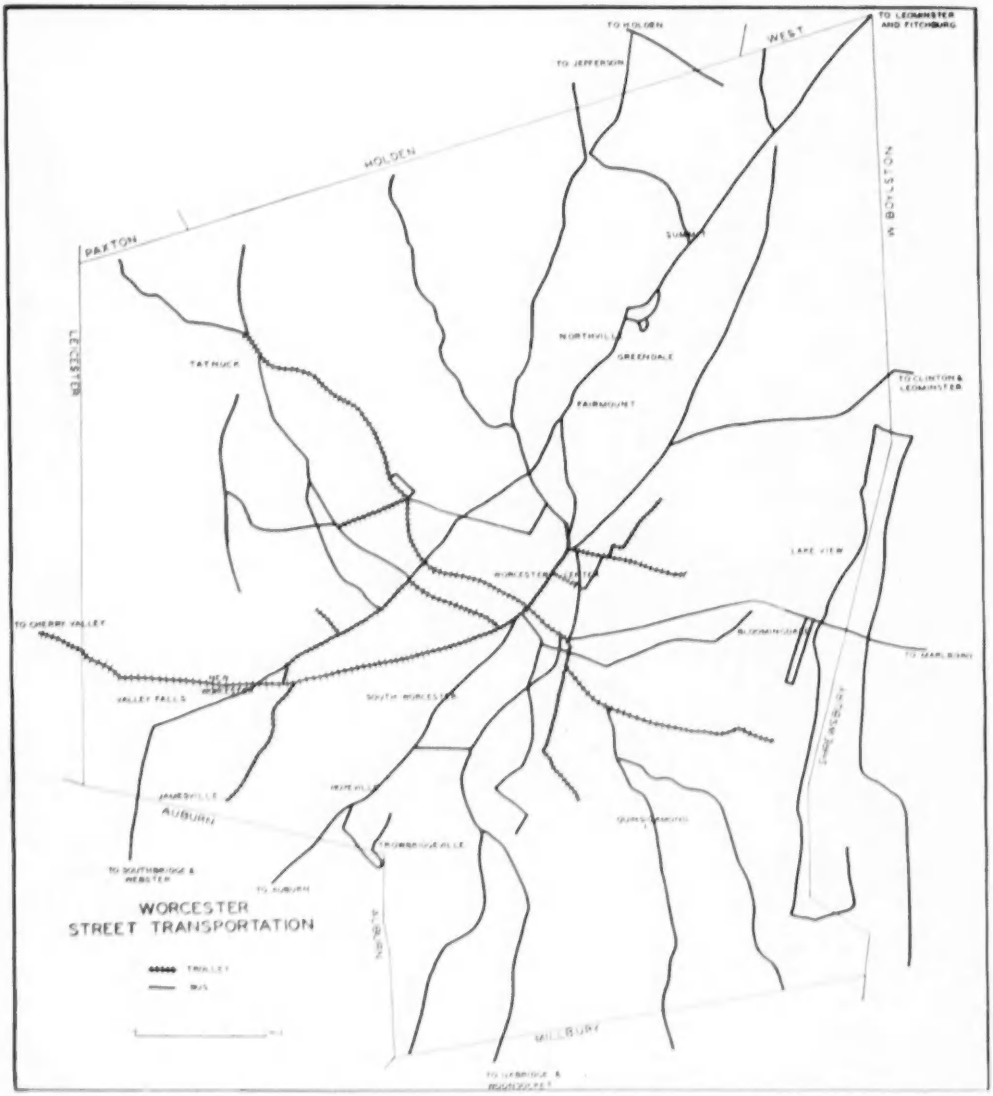


FIGURE 2.—Transportation routes within Worcester and to its surrounding towns. Summit, Quinsigamond, Northville, etc. are towns which have been incorporated into the city.

Complexity of glacial features is further shown in the complicated drainage system of the Worcester area. Sources of streams are widespread, large and small basins occur along the courses of the streams. Sometimes the stream courses have been gouged out by the glacier, and sometimes are formed in the uneven cover of glacial debris. The many swamps, lakes, and bogs characteristic of a recently glaciated area, indicate that modern streams have not been able effectively to drain their basins in the comparatively short time since the glacier disappeared. Low areas were formed by kettle holes or glacial damming. Sediments carried into obstructed basins by streams, and decaying vegetation eventually filled some lakes to form bogs, lakes, swamps, and bog filling continues actively even now.

Soils.—Fertility of the local soils attracted settlers; it continued until 1830 to serve as the most important element in increase of Worcester's population. Worcester Village remained an agricultural community to which settlers came because better farm lands were available there than elsewhere, even though Worcester soils were thickset with boulders which had to be removed toilsomely and painfully before the land could be plowed and crops harvested.

Today soils play a minor role within the city, but even yet, soils are important in towns contiguous to Worcester for the uses to which they are put, whether for residential expansion, dairying, or truck farming depends in large part on their innate character.

As in the rest of New England, the soils of Worcester and its vicinity are developed in materials predominantly produced by glacial action. The soils have been formed from the deposit of glacial drift of varying thickness which overlies the entire area. On the whole they are young, for they have not yet developed a well marked soil profile. The parent materials from which the soil is formed have not yet had sufficient time to be broken down and translocated to form mature profiles. Furthermore, the long cold season during which soil formation ceases, decreases the amount of time by seven months in the year when soil reactions can take place.

Derived largely from underlying or neighboring rock, the parent material is little decomposed, with the result that the soils bear close relationship to the geological formations and form related groups that parallel related rocks. In Worcester and its surrounding towns, the Gloucester, Bernardston, Charlton, Paxton, Merrimac, and Hinckley soils are represented.

Vegetation.—The area lies in the zone between the northern and southern flora, where spruce and white birch of the north mingle with the oak and chestnut of the south, and birch, beech, maple, and hemlock constitute a transitional type.

THE GROWTH OF WORCESTER

The early history of the Worcester area was characterized by agricultural self-sufficiency, each farm providing the major part of the farm family's living, each town an almost self-sustaining unit. In these self-contained rural communities, each village had its blacksmith, miller, and minister, who were also at the same time farmers, differing little from their fellows. The ideal at the time was a good family living gained from self-sufficient farms. The hummocky topography and the stony soil of the region could well be adapted in successfully attaining this goal.

As the industrial revolution progressed the farmers fortunate enough to have mill sites, and fore-sighted enough to develop them, evolved a system of manufacture organized in small units to which they devoted themselves and produced goods of relatively small bulk and high value. As industries grew, they required more labor, living near the mill, and consequently population was concentrated in villages and cities.

In a region which contains an urban center like Worcester where industry plays a leading role, the rural areas differ from those which are farther removed from the urban center. Two reacting forces are at work; the one attracts activity to the urban center, the other tends to project urban influences into the surrounding territory. The urban center draws upon the outlying areas for its workers in factories, stores, and offices; it depends upon the farms surrounding the center or urbani-

zation for a large share of its food supply, especially those perishable foods which do not bear transportation costs well. In turn, the urban center provides retail stores, commercial and professional services, and places of entertainment for rural dwellers. Transportation facilities toward the center are facilitated and a ready market for products of the rural area are provided. The effects upon agriculture can be detected in many ways. The cost of production is higher because of the higher wage scale, and the higher valuation of land because of an assured market, but the proximity to the market has very definite advantages and compensatory features. These circumstances point out the use to which the land is put in rurban areas.

The city's need for farm products encourages production of such things as would not stand shipment for long distances: milk, eggs, poultry, truck, and fruit. Ruggedness of topography and inability to use large power machinery upon rough, uneven land makes it inevitable that agriculture in New England be an industry maintained on small farm units.

Urban influences are projected into surrounding rural areas when many city dwellers move from high rent and congested sections of cities to the country. They maintain their contacts with the city, moving into it each day and home to the country each night. Since most of their waking day is spent in the city, the ideas and ideals of the city unavoidably become part of those of the country. The population that is purely rural finds easy access to the city because transportation routes are highly developed (Figure 2), constant travel between the two environments results in a mixture of country and city thought which eventually becomes almost wholly citified because every interest is focused on the urban area.

A rurban area has very definite advantages over a strictly agricultural or rural area from the farmer's point of view. Aside from the advantages of ready transportation to market and a market with a steady demand, municipal services such as water, light, gas, and power are available at lower rates than in strictly agricultural areas. Also, the burden of taxation is distributed among a greater number of persons, most of whom are not farmers and consequently have income other than that earned from the land.

On urban fringes the production of agricultural products is by a significant proportion of the people who farm on a part-time basis. A part-time operator, according to the gauge used in the census reports, is one who works one or more days off the farm. The owner only is counted as the part-time operator and the census enumeration does not take into account the fact that instead of the owner, often some member of the family contributes to the maintenance of the farm by engaging in some nonfarming endeavor. According to Rozman, in a study made of part-time farming in Holden, 519 part-time farmers raised 46.2 per cent of the total value of all products in the town.

The very characteristics—hills, stones, lakes, streams—which hinder commercialized agriculture on a large scale have enhanced the attraction of the countryside for residential and recreational purposes.

The heaviest impact of urban upon rural life is supplied by the free and individual movement back and forth, made possible by the privately owned automobile and truck. Rurbanization inevitably follows, and the settlement of adjacent farming areas by families that have adopted occupational arrange-

ments that are a combination of the rural and urban.

Rural areas have always absorbed significant part of the shock of economic reversals which appear periodically in industry and commerce. Ample illustration is found after the 1929 stock market crash when almost all rural communities show a sharp rise in population. In depression years city jobs are at a minimum, and many people find themselves without adequate income to support their families. If they have come from a farm originally, sometimes a member of the family is still working it, and the city dweller moves back to the farm until he can again find employment in some city occupation. Sometimes he buys a farm and expects to grow enough food for his family, even if the cash income is insignificant, until the depression is over and other non-farm work is available.

Development of Land Utilization.—The development of land utilization in towns surrounding Worcester may be divided into six different stages. Settlement and clearing of land for occupation marked the first stage. The times were hazardous; Indian attack was always to be feared and anticipated.

General farming with an ideal of self-sufficiency characterized the second stage. Everything used by the family except a few luxuries like tea or a bit of calico was produced on the place. Home was a busy workshop in which there was no room for idle hands. Growing and storing food for winter use, growing, carding, spinning, and weaving flax and wool, and finally fashioning the cloth into clothing and bedding gave all much hard work to do. Even social life was influenced by perpetual need for all to work in order that life could be sustained, for quilting bees, barn raisings, and corn husking contests marked the social life of the community. The professional men, the doctor, minister, miller, blacksmith, cobbler, tinsmith were also farmers. All shared a common interest in the weather and crops, for all were equally affected by them.

By 1830, stock raising, the third stage of land use development was the most important branch of agriculture. The adaptability of the soil to growing grains is mentioned early by several people who travelled through this region. Tilled crops also formed an important item in the agricultural system. Corn, rye, oats, and tame grasses occupied by far the largest part of the tilled land on the farm, and they supplied both winter feed for animals and bread for men. Labor was no longer necessary to do the initial clearing of the land, and surplus labor was on hand. It was in this stage of land use development that home industries were introduced to put this surplus labor to good use.

When the Erie Canal was opened, the initiation of the fourth stage of land utilization was at hand. The flow of foodstuffs from the Middle West to New England increased in volume annually. Transportation charges were a minor consideration in determining prices of products grown on more fertile, more easily tilled farms of the West. Farming in New England became unprofitable especially as compared with the money that could be earned in the mills. Many New England farms were abandoned. Some farmers went westward to share in the rich profits that could be wrested from the soil, others took jobs in mills. At this stage of land utilization, mills were still small, but with the introduction of railroads manufacturing enterprises became more centralized. The continual movement of people from rural districts to the more attractive commercial and in-

dustrial communities gave rise to large concentrations of population in a few large towns and manufacturing centers.

The concentration of large numbers of people in cities stimulated food production. The western lands were still providing a goodly share, but the fifth stage of land utilization was then inaugurated: agricultural specialization and particularly the rise of the dairy industry. The perishable nature of milk makes it imperative that it be produced near the place where it is to be consumed. Western farms could provide butter and cheese profitably, for they have high value for weight and volume, but fresh milk because of its fluid character and its relative bulk cannot stand the cost of transportation even if it were not so perishable.

The sixth stage of use of land in the region, the present stage, is commercialized intensive agriculture—dairy products, garden truck, poultry products, and products of orchards—combined with subsistence agriculture for the farm family. Urban congestion during all this time was increased and its consequences: rising costs of living, high cost of land in the city, and cheaper land in the country has started a back-to-the-land movement. The development of the automobile and the subsequent construction of excellent highways paved the way for use of land for residential and recreational purposes. Suburban use of land is crowding out agricultural use in towns surrounding Worcester. Hundreds of acres of former farm lands are being subdivided into building lots, and modest old farm houses remodeled into modern suburban homes.

The percentage of people engaged in non-agricultural pursuits in 1915 was high in all of the towns surrounding Worcester (Tables I and II). Paxton which had the lowest percentage employed in non-agricultural occupation in 1915 (38.2 per cent), is followed by West Boylston in which 67.4 per cent of the population was engaged in occupations off the farm. The discrepancy between the two towns is great. Paxton's working population of 61.8 per cent was engaged in agricultural pursuits and only 32.6 per cent of that of West Boylston was so employed. Paxton has never had the transportation facilities that the other surrounding towns have enjoyed, and consequently manufacturing enterprises were not attracted to it. By 1935, however, Paxton which only twenty years before had only 38.2 per cent of its population employed in non-agricultural occupations had 65 per cent so engaged, an increase of almost 25 per cent.

Millbury led in 1915 all the surrounding towns in the number of people employed off the farm with 92.9 per

TABLE I

PERSONS ENGAGED IN AGRICULTURE IN WORCESTER AND ITS SURROUNDING TOWNS

	1885	*1895*	*1905*	*1915*	*1935*
Auburn	91	102	112	218	187
Grafton	176	146	157	366	250
Holden	171	109	135	220	159
Leicester	108	65	75	188	196
Millbury	95	77	95	153	158
Paxton	76	57	103	115	85
Shrewsbury	152	153	175	302	204
W. Boylston	104	98	89	149	...
Worcester	232	435	407	865	223

TABLE II

PERCENTAGE OF PEOPLE EMPLOYED IN NON-AGRICULTURAL OCCUPATIONS IN WORCESTER AND ITS SURROUNDING TOWNS

	1820	*1840*	*1865*	*1885*	*1915*	*1935*
Auburn	20.0	13.8	26.4	61.9	83.3	92.0
Grafton	41.9	71.7	74.1	82.8	87.9	93.0
Holden	34.3	14.9	44.3	70.1	77.9	88.0
Leicester	46.9	45.9	71.3	75.9	86.9	88.0
Millbury	33.5	61.5	86.9	89.9	92.9	93.0
Paxton	33.9	33.0	....	38.9	38.2	65.0
Shrewsbury	36.3	34.9	34.0	39.2	74.3	91.0
W. Boylston	27.5	33.0	71.9	82.9	67.4	73.0
Worcester	36.0	49.2	94.8	96.7	98.9	99.8

cent, followed by Grafton with 87 per cent of the working population engaged in non-agricultural occupations. Grafton and Millbury, the towns south of the Worcester catchment basin, have always been predominatingly manufacturing towns because the increased amount of water made the production of more water power possible.

There is, however, no manufacturing of great significance in many of the towns with a high percentage of people in non-agricultural occupations. The reason is that the census figures on occupations were taken according to the place of residence and not according to where the people worked. It must then be surmised that the workers must go outside the town to their jobs, and Worcester with its many diversified industries, its shops, and stores are where most of them are employed. Agriculture is highly specialized and commercialized; dairy, poultry, and truck farming or orcharding predominate. There is much small-scale non-commercial farming, and much land has been retired from productive use and put into consumer's use as estates, rural non-farm residences, or used purely and simply for recreational purposes, as golf greens, picnicking grounds, and state forests.

POPULATION TRENDS IN WORCESTER AND ITS SURROUNDING TOWNS

Cityward migration reversed itself sometime between 1910 and 1920. When rurban conditions of life became as advantageous as those offered in a city, people began to balance the advantages of living in the country with the disadvantages of living in the city and found that the country as a place to live is more desirable. The bold and venturesome tried it first and others followed. The back-to-the-country movement is a major trend of depression years. Data showing the tendency for urban to rural movement are not directly available but must be inferred from a study of population figures for those areas which lie outside the city limits. The area surrounding Worcester, where city and industrial qualities are superimposed on an otherwise rural and agricultural economy has definite agricultural and land use attributes as we have seen.

TABLE III

INCREASE IN POPULATION IN WORCESTER AND ITS SURROUNDING TOWNS IN PERCENTAGES FROM 1910 TO 1940

	1910	*1940*	*Per Cent*
Auburn	2420	6629	173
Grafton	5705	7500	31
Holden	2147	3924	82
Leicester	3237	4426*	36
Millbury	4740	6983	47
Paxton	416	793	88
Shrewsbury	1946	8028	314
W. Boylston	1270	1822	43
Worcester	145986	193694	32

*1910-1935.

Table III summarizes the increase of population of Worcester and its surrounding towns in percentages, between the thirty-year period of 1910 to 1940. It shows that two towns, Auburn and Shrewsbury, have made relatively large population gains, two others Holden and Paxton have almost doubled their population in thirty years, and the remaining surrounding towns have made only minor average increases. Auburn and Shrewsbury show increases of 173 per cent and 314 per cent respectively; Holden and Paxton increases of 82 and 88 per cent, and Leceister shows an increase of only 36 per cent. Leicester shows neither the lowest percentage of increase nor the highest of the lower percentage increase towns. The towns south of Worcester, Grafton and Millbury, have been and still are predominantly manufacturing towns, and industry still plays an important role in

their life. The towns north of Worcester, although they have some factories were primarily at heads of the brooks which were dammed farther south along the Mill and Blackstone Rivers, so important in the early development of Grafton and Millbury.

In the early decades of settlement, between 1790 and 1830 the curves of population of all the towns follow nearly the same courses, roughly parallel, but after this initial stage a period of transition follows from 1830 to 1850 in which the figures of some of the more agricultural towns linger at about the same level (Auburn, Shrewsbury, Holden, and Paxton) and in fact, sometimes rise a little (Table IV). The towns which later were to make great advances in industry (Grafton, Millbury) show rapid rise in the population graph; Grafton starts a very steady rapid upward trend in 1820 (Figure 5).

After 1850 a conspicuous divergence in trend develops: purely agricultural towns slowly but steadily decrease in population (Paxton, Auburn, Shrewsbury), and manufacturing towns increase rapidly and continuously in size (Millbury, Worcester). The change in the trend of the curve does not come at the same time for all the towns because of varying geographic and economic conditions.

Auburn.—The population of Auburn rises very gradually representing the growth of an entirely agricultural town with a few small industries. In 1900 a change becomes apparent in the curve's sharp rise. Auburn is the town nearest the center of Worcester, and its periphery adjoining the city has been built up as a continuation of Worcester. Effects of improved transportation, and expansion of Worcester toward Auburn upon the population increase are clearly reflected in the rapid upward rise of the population of the town. The opening of the nineteenth century marks the beginning of rurbanization of Auburn with its greatest percentage increase in the decade 1910 to 1920, when the pop-

TABLE IV

POPULATION OF WORCESTER AND SURROUNDING TOWNS

Year	*Auburn*	*Grafton*	*Holden*	*Leicester*	*Millbury*	*Paxton*	*Shrewsbury*	*W. Boylston*	*Worcester*
1765	....	763	495	770	.....	....	1401	....	1478
1776	....	861	749	1005	....	558	1475	.....	1925
1790	473	872	1077	1076	....	558	963	.....	2095
1800	532	872	1142	1103	.....	582	1048	.....	2411
1810	540	946	1072	1181	..	619	1210	632	2577
1820	608	1154	1402	1252	926	613	1458	886	2962
1830	690	1889	1719	1782	1611	597	1386	1055	4173
1840	649	2943	1874	1707	2171	670	1481	1187	7497
1850	879	3904	1933	2269	3081	820	1596	1749	17049
1855	855	4409	2114	2589	3286	792	1636	2310	22286
1860	914	4317	1945	2748	3296	725	1558	2509	24960
1865	959	3961	1846	2527	3780	626	1570	2294	30055
1870	1178	4594	2062	2768	4397	646	1610	2862	41105
1875	1233	4442	2180	2770	4529	600	1524	2902	49317
1880	1317	4039	2490	2779	4741	592	1500	2994	59291
1885	1268	4498	2471	2923	4555	561	1450	2927	68389
1890	1532	5002	2623	3120	4428	445	1449	3019	84655
1895	1598	5101	2602	3239	5222	426	1524	2968	98767
1900	1621	4869	2464	3410	4460	459	1626	2314	118421
1905	2006	5052	2640	3414	4631	444	1866	1571	128135
1910	2420	5705	2147	3237	4740	416	1946	1270	145986
1915	3281	6250	2514	3322	5295	471	2794	1318	162697
1920	3891	6887	2970	3635	5653	489	3708	1624	179754
1925	4927	6973	3436	4110	6441	591	5819	1916	190757
1930	6147	7030	3871	4445	6957	672	6910	2114	195311
1935	6535	7681	3914	4426	6879	731	7144	2158	190471
1940	6629	7500	3924	.....	6983	793	8028	1822	193694

ulation increase was 60.7 per cent. The end of the period of rapid growth of population had come by 1930. In the decade 1930 to 1940 population increased only 7.8 per cent. While total population has been increasing, the rate of increase has been decreasing (Figure 3).

Grafton.—Because Grafton partly is an industrial town, its population rises sharply with improvement in business and falls just as abruptly with decline in business. From 1765 to 1820 the curve rises slowly but steadily, for this is the period of agricultural economy with the few small scattered mills necessary to a more or less self-sufficient economy: grist mills, saw mills, etc. In 1820, however, the population figures rise sharply indicating the beginning of the period of industrial expansion. In the decade 1870 to 1880 the curve drops significantly, a fall probably caused by the 1873 depression. From 1880–1890 the population figure again swings upward and the number of persons has increased beyond the point reached in 1870. Between 1890 and 1900 the number of persons once more decreases, caused by the panic of 1893. Between 1900 and 1920 the curve rises abruptly and rapidly probably because of a combination of improved business conditions and the tendency of the people who worked in Worcester to seek homes outside the city.

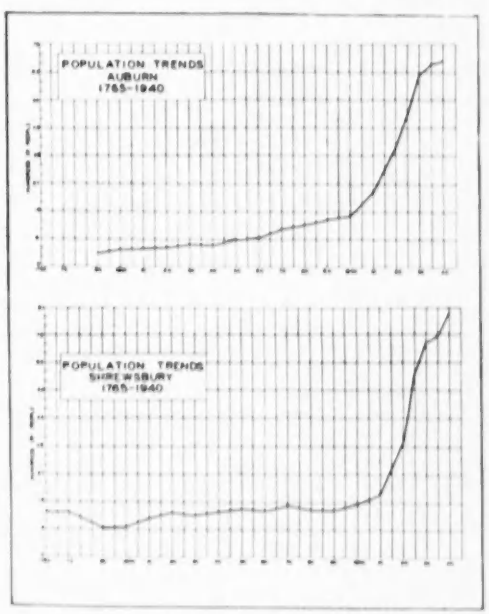


FIGURE 3.—Population graphs for Auburn and Shrewsbury; towns which show the greatest rurbanization.

Leicester.—As long as agriculture engaged the labor of the folk of Leicester its increase in population was slow and steady, but with the introduction of employment other than cultivation of the soil in 1820, the population figures rose conspicuously. The sharp rise in population figures between 1820 and 1860 marks the development of industry in Leicester. The mills were flourishing in these days and foreigners were coming to Leicester to work in the mills. It was in this span of years also that the railroad was built. Between 1860 and 1910 the population rose and fell, sporadically, probably because of the various panics. From 1910 to 1930 the population has risen steadily. An upward swing caused by the rapid rurbanization which took place during these years.

Holden.—A slow steady rise in population is indicated between 1765 and 1800 which is usual for the period of agricultural self-sufficiency. Between 1810 and 1890 the years which mark industrial expansion, the population figures rise. Between 1890 and 1910 a decided downward trend in population is apparent. The railroad tended to localize the mills in Jefferson, which meant that their numbers were decreased, and Quinapoxet once a thriving little factory center, was almost entirely abandoned having been purchased by the Metropolitan Water Commission to serve as catchment basin for the Boston water supply.

A new trend rapidly upward, and

probably beginning the Worcester rurbanization of Holden clearly appears in 1910. Only between the years 1930 to 1940 does the number level off, which might have been caused by the aftereffects of the world depression of 1929.

Millbury.—Millbury was part of Sutton until 1813. The difference of geographic environment between the two towns is what caused their division. Millbury was on the Blackstone River and on the route of the Blackstone Canal and it was a thriving industrial town with agricultural pursuits of only secondary importance. Sutton was, and for that matter still is, a rural community. The statistics for Millbury as a town start in 1820, which is also the generally accepted date for the beginning of industrial expansion. The population graph rises rapidly and steadily to 1880. From 1880 to 1910 the population decreases and then the same population figure is attained in 1910 as in 1880. This period between 1880 and 1910 felt the effects of two financial depressions, those of 1893 and 1907. From 1910 to 1930 there has been a steady upward trend in the population which seems to indicate some rurbanization of Millbury.

Paxton.—Paxton has remained purely agricultural throughout its history, has never been industrialized, and has not been crossed by any railroad. The population figures rise slowly and steadily to 1830, which is normal for nearly all neighboring towns. From 1830 to 1850, however, the population trend is rapidly upward. Paxton was an important stopping place for stage coaches from Worcester and Boston to Brattleboro and Barre, an important inland artery in 1840. When the railroad was built its importance as a stopping place ceased. From 1850 the population steadily declined until 1910 when the lowest point in population in the whole

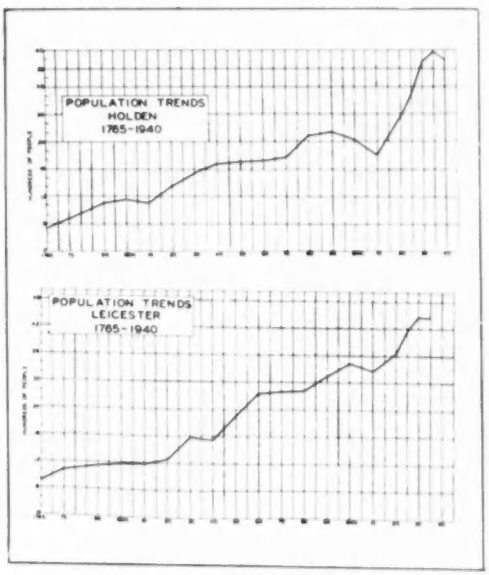


FIGURE 4.—Population graphs for Holden and Leicester.

history of the town was reached. When motor transportation improved, the number of people in the town increased. Although Paxton is only seven miles from the center of Worcester, it is one of the few towns that has not had steam or electric trolley service, a lack which has been largely responsible for its retarded development (Figure 6).

Shrewsbury.—Shrewsbury was incorporated as a town in 1727, and its population like all New England towns of this study rose steadily. The beginning of the twentieth century, however, marks the initiation of a phenomenal change in population figures. In a span of forty years, from 1900 to 1940, the population increased from 1626 to 8028, an accretion of 6402 persons. Since the industries of the town never have been able to support many people, and in any case the factories have declined, the large increase can be attributed only to the back-to-the-country movement characteristic after 1910.

West Boylston.—The figures for West Boylston begin in 1810 when it was set

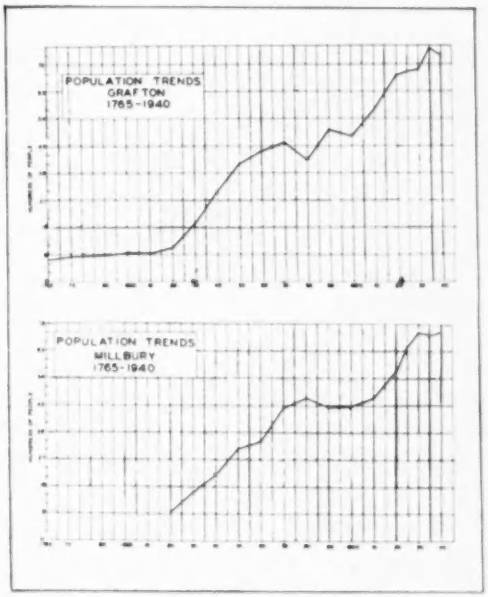


FIGURE 5.—Populations graphs for Grafton and Millbury, mill towns south of Worcester.

apart as a township. The town was favored with a large supply of water power afforded by the Quinapoxet and Stillwater Rivers which join to form the south branch of the Nashua River. From 1810 to 1840 the population rose steadily, and more rapidly until 1890. The railroads had been built, and West Boylston was a flourishing industrial town with mills for manufacturing cotton, spinning and weaving machinery, boots, boot tools, church and parlor organs, and oak baskets. In 1890 the Wachusett reservoir was set aside, and the large and profitable manufacturing industries as well as the most productive agricultural portion of the town was inundated. In 1910, however the population again began to increase, probably because the means of transportation between West Boylston and Worcester were much improved with the perfection of the automobile and the construction of good highways, both of which are conducive to rurbanization. The reservoir took on new importance as an attractive scenic feature.

Worcester.—Worcester exhibits the typical population figures for an expanding city. The figures rise slowly up to 1840. With the construction of railroads the curve rises rapidly and steadily to 1930. In 1930, a slight decrease in population is evident which may reflect the tendency of the population to seek homes in the surrounding towns rather than the city itself.

CONCLUSION

As population increases within an area and its economy develops best to serve the growing needs of the more complex society into which the population is organized, the use of the land becomes more nicely adjusted and more intensified, and manufacturing more closely shaped to the advantages the land affords. The area of Worcester and its neighboring towns, a quasi-piedmont between the Central Upland and the Boston and Narragansett basins, represents a continuous progressive adjustment of man's use of the terrain to meet the changing needs of a growing population in accordance with improved agricultural techniques, modernized and more efficient manufacturing processes,

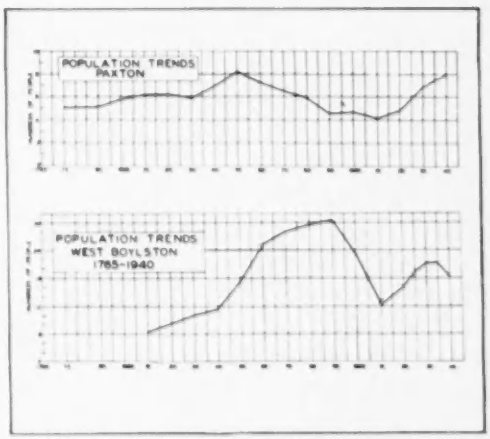


FIGURE 6.—Population graphs for Paxton and West Boylston, agricultural towns.

and an accelerated and facilitated transportation system that has broken down distance and brought into closer and more direct relation every important center and its periphery. The use of land for agriculture in Worcester County affords a kind of gauge for the progress of man's nicer adjustment to his environment, the early primitive and experimental agriculture of the first settler, general, subsistence, extensive farming has gradually given way to one successive improved stage after another, until the present selective, specialized commercial type, like dairying, apple growing, cranberry-growing, turkey rearing, and many others, monopolizes farming. The use of the better land is more intensive and selective, whereas the poorer land has been relegated to forest or indifferent woodland.

Though use of land not only for agriculture but for other purposes like residence and recreation represents a basic adjustment, it also reflects an adjustment, more indirectly and indefinitely but none the less effectively geographical, to such related attributes as facilities for transportation, proximity and organization of markets, extent and character of taxation, and social and political regulations. All land use is as significantly adapted to such human attributes, as to the physical character of the countryside. In Worcester County the land use constitutes a long developed, gradational adjustment to physical terrain modified by changing adjustment to man's cultural progress.

Agriculture was the use to which the land was originally put when the region was settled. The climate is essentially continental with a strong littoral element at certain seasons. The precipitation is ample throughout the year, and the growing season long enough to mature a wide variety of crops. The soils have not proceeded far in the development of their profiles, but are fertile and easy to work once the boulders have been removed. The vegetation is a transition type between the conifers of the north and the hardwoods of the south. All the land has been cut over at one time or another. The native grass furnished excellent pasture for dairy cows and steers for beef.

The present agricultural use of land is basically for dairying. Pastures are used in summer for grazing. Large quantities of feed must be raised or imported because of the necessity of housing the animals during the winter. Poultry is gaining a significant place in farming for the production of both meat and eggs. Proximity to a near-by large urban center has made truck farming in the towns surrounding it a profitable agricultural enterprise.

The topography is well suited to the development of manufacturing industries. Numerous small streams could easily be impounded to furnish water power for the mills auxiliary to settlement. Manufacturing expanded and eventually employed more people than did agriculture.

Modern methods of transportation are important, for they have changed the significance of primary geographic factors. Distance is no longer as important as is accessibility. The rapid development of trucking has freed in some measure manufacturing from sites near railroads. The transmission of hydroelectric power has given manufacturers wider choice as to where their mills can be placed.

The present world conflict has temporarily halted further rurbanization, but in all probability rurban development will progress rapidly when labor and building materials are once more available.

MAJOR CITIES OF INDIANA

Otis W. Freeman

THERE are 35 cities of over 10,000 population in Indiana and an analysis of the number, kind and value of sales of their retail, wholesale and manufacturing establishments forms the subject of this paper. All statistics are taken from the sixteenth census of the United States for 1940 and the wartime developments since that date are not included, primarily because statistics are not available.

On the basis of population the 35 Indiana cities are divided into four groups. Indianapolis (386,972) with nearly 400,000 population is in a class by itself. Eight cities make up group-2 between 50,000 and 120,000 people. East Chicago, Evansville, Fort Wayne, Gary, Hammond, Muncie, South Bend, and Terre Haute have above 50,000 population and Muncie with 49,720 inhabitants is included in this group as the nearest thousands are used in the analysis. The third group numbers 11 cities between 20,000 and 49,000, and the fourth group contains 15 cities of 10,000 to 20,000.

In classifying cities as to their importance for retailing, wholesaling, and manufacturing, the trade of each of the three classes was calculated in terms of dollars per inhabitant per year. Thus, Indianapolis in 1939 had $890 wholesale trade, $703 manufactures, and $487 in retail trade per inhabitant. In wholesale trade the city is in a class by itself, handling 44.2 per cent of Indiana's wholesaling, while having only 11 per cent of the population of the state.

Retail Trade

In retail trade 27 of the 35 cities are in groups-1 and-2 and three others are close to being included. The basis for this classification is that retail sales per urban inhabitant in group-1 were above $500, in group-2, $400–$500, group-3, $300–$400 and group-4 under $200. As might be expected a city is usually a good retail center. The poorest showing as retail centers is made by the Calumet industrial cities (except for Hammond) and suburban residence cities like Mishawaka, Jeffersonville, and New Albany.

In general the larger the city the more annual sales occur per store, and the larger the number of inhabitants per store. Thus eight cities in the 50–120,000 population class have sales of $29,090 annually, 11 cities of 20–49,000 population average $27,990 per store and 15 cities of 10–20,000 population have $25,200 sales per store. For the inhabitants per store, Indianapolis has 74.3 persons, the 50–120,000 cities 68.75, the 20–49,000, 62.45, while in the 10,000 to 20,000 group the persons drop to 55.67. To some extent the smaller cities probably depend more on rural trade than bigger cities. For example, Columbus with 44 persons per store, Crawfordsville with 47, and Vincennes with 51, would seem to depend on neighboring farms for a considerable degree of their retail trade.

Three cities: Gary with 80, Hammond with 81, and Mishawaka, a suburb of South Bend, with 77, have more inhabitants per store than big Indian-

apolis, doubtless because these three cities depend almost wholly upon their urban population and the stores seldom serve farm residents. On the other hand, Whiting, almost entirely an industrial city, has a low number of inhabitants per retail outlet with 58 persons per store, and the sales also are low, only $17,620 per store—showing that the establishments are small neighborhood affairs. East Chicago, another industrial suburb, has 73 persons per store, with sales of $16,680 annually, the lowest in any of the larger urban centers. Two other cities with small stores are Jeffersonville (58 persons per store, sales $17,870 per year), and New Albany (53 people per store with sales of $16,860 annually), the latter being the lowest of any city above 20,000 population in Indiana. The explanation is that both Jeffersonville and New Albany lie across the Ohio from Louisville and are suburbs of that city, and the usual suburban store is a small establishment serving the immediate neighborhood. Two industrial cities of the Calumet District, Hammond and Gary, are high both in persons per store and sales per store. Hammond with $36,740 per establishment yearly being slightly ahead of Indianapolis, and Gary with $30,890 ranks well in this regard. The absolute leader among the 35 cities of Indiana in sales per store is Lafayette with $40,650 annually. In Lafayette there are 63 persons per store, only one-half a person from the average of its class cities (20–49,000). The large sales may be thought to come both from a productive rural area near by and from the faculty of Purdue University in the separate municipality of West Lafayette. The latter city, however, has 70 stores with a trade of $34,943 per establishment, which is high for a town of 6270 persons, but of course in addition to the regular residents the students help swell the volume of trade. Bloomington, the site of Indiana University, has 62 persons per store, almost the average, but sales total $30,610 per establishment annually, which is 9.4 per cent above the average for cities of 20–49,000 inhabitants. Other cities with sales above $30,000 annually per store are: South Bend ($31,955), Fort Wayne ($30,196), Muncie ($30,220), Elkhart ($31,050), Richmond ($30,250), LaPorte ($31,710), and Shelbyville ($31,670). It will be noted that the cities with the largest sales per store include the state's largest cities, those with big factories and payrolls, university centers, and those in highly fertile regions where prosperous farmers and residents of small surrounding villages help to increase the retail trade. These cities are also all in the northern and middle sections of the state. The cities lowest in retail trade per store are: suburbs of large cities, and cities in comparatively poor farming regions. The low rank of Peru ($23,380) and Bedford ($22,475) is probably in part explained by the depressed condition of their industries in 1939. Sometimes the low value in trade per store is due to more stores in a city than is usual for its population. The majority of such stores are small proprietor type establishments which with little expense for clerical help can survive on a small income.

In retail trade, Indianapolis is a cross-section of the state, but like other large cities draws customers from the surrounding territory so that the value of retailing in proportion to population is higher than for the state as a whole. Thus with 11.3 per cent of the population of the state (3,427,996) the city does 17.7 per cent of the retail trade (188 out of 1066 million). In certain lines, like women's clothing, furniture, and jewelry, Indianapolis secures an

especially large share compared to its population. The greater retail trade of Indianapolis is carried on in slightly less than the average number of stores for the state in proportion to population, the city having 11.2 per cent of the stores and 11.3 per cent of the population in Indiana. There are 47,317 stores in Indiana and they average $22,749 in retail sales per year. Sales per store in the cities are more than for the state as a whole. Thus cities of the 100,000 class have about $30,000 in sales per store while stores of Indianapolis sell $36,204 per store annually. This result comes from the large sales of certain department stores and large specialty stores for things like furniture, apparel, jewelry, and office equipment. In Indianapolis the food stores and eating and drinking establishments in the value of their sales, are below state averages. The food stores of the city are largely of the neighborhood variety and are more numerous but do less percentage of trade compared to population than in the state as a whole. They constitute nearly one-third (32.4 per cent) of all Indianapolis stores but total only 18.3 per cent of the value of business as compared with 28.4 per cent and 21.7 per cent respectively in the entire state. However, the average Indianapolis food store (grocery, meat,

TABLE I

RETAIL STATISTICS

City	*Population*	*People Per Store*	*Number of Stores*	*Sales (000 omitted)*	*Sales Per Store*	*Sales Per Person*
Anderson	41,572	59.3	698	$19,794	$28,359	$476
Bedford	12,514	54.	232	5,214	22,474	417
Bloomington	20,870	62.	337	10,315	30,611	494
Columbus	11,738	44.	265	7,111	26,834	606
Connersville	12,898	61.4	210	5,103	24,300	396
Crawfordsville	11,089	47.2	235	6,122	26,051	552
East Chicago	54,637	72.9	750	12,560	16,680	230
Elkhart	33,434	71.6	467	14,501	31,051	434
Elwood	10,913	62.	176	4,281	24,324	393
Evansville	97,062	63.8	1521	45,234	29,740	466
Fort Wayne	118,410	67.	1761	56,175	30,196	474
Frankfort	13,706	60.	231	6,864	29,714	501
Gary	111,719	79.7	1401	43,275	30,888	388
Goshen	11,375	55.5	205	5,843	28,502	514
Hammond	70,184	81.	867	31,858	36,740	453
Huntington	13,903	54.1	257	6,245	24,300	449
Indianapolis	386,972	74.3	5208	188,553	36,204	487
Jeffersonville	11,493	58.3	197	3,520	17,868	304
Kokomo	33,795	64.	529	14,657	27,707	434
Lafayette	28,798	63.2	456	18,538	40,653	644
LaPorte	16,180	60.9	266	8,435	31,710	521
Logansport	20,177	52.4	385	9,712	25,226	481
Marion	26,767	55.	487	13,307	27,326	497
Michigan City	26,476	67.	395	10,723	27,147	407
Mishawaka	28,298	77.	368	8,354	22,700	295
Muncie	49,720	64.	778	23,511	30,220	470
New Albany	25,414	52.9	482	8,128	16,863	332
New Castle	16,620	61.8	269	7,489	27,840	451
Peru	12,432	53.6	232	5,424	23,379	445
Richmond	35,147	63.	556	16,818	30,250	478
Shelbyville	10,791	52.6	205	6,493	31,673	601
South Bend	101,268	67.4	1502	47,996	31,955	474
Terre Haute	62,693	53.7	1167	33,668	28,850	539
Vincennes	18,228	51.	358	9,471	26,457	519
Whiting	10,307	58.2	177	3,119	17,621	303

fruit, dairy products, etc.) grosses $20,474 per annum as compared with the state average outside of the one city of $16,700. The usual eating and drinking place in Indianapolis is quite small and such concerns have average sales of only $10,500 per year. There are more proprietors than establishments showing the frequency of partnerships and family concerns. Employees of eating houses are poorly paid with an average wage of only about $500 per year. Possible explanations include: part-time employment, rapid turnover of labor, and dependence on tips for part of their income. Filling stations are fewer in number than the state average to population but do about twice the business per station customary in Indiana. Automotive outfits are much larger in proportion than the state average. General merchandise stores are only 2.86 per cent of the number of stores in Indianapolis, but they do 20 per cent of the city's retail trade showing that many are of large size. About 13 per cent of all of this kind of store in the state are in Indianapolis, a proportion slightly exceeding the city's per cent of Indiana's population. In most of the state, variety stores do much of the business in this group. In furniture, Indianapolis stores are larger, as the usual thing, than those in the rest of the state, the city having one-ninth of Indiana's furniture stores, yet doing one-fifth of the state business in that line.

WHOLESALE TRADE

The wholesale trade of Indiana totaled $847,000,000 in 1939 which was over two hundred million ($219,000,000) below that of the retail trade. Much of this difference is explainable from the markup in selling price by a retail store and from purchases by retailers directly from producers. In addition some Indiana retailers can more conveniently buy from wholesale establishments in Chicago, Cincinnati, and Louisville, just across the stateline, than from Indianapolis or other wholesale center within the state's boundaries. While Indiana wholesalers also sell goods in adjacent states it is improbable that the value of goods sold anywhere near approaches the value of goods purchased across statelines.

Few cities are important for wholesaling in Indiana. There is only one city, Indianapolis, with nearly $900 of annual sales per inhabitant, in group-1. Group-2, with $400 to $550 per inhabitant, includes four cities: Fort Wayne and South Bend in the north, and Evansville and Terre Haute in the Wabash Lowland. Except for the Calumet cities these four include all municipalities above 60,000 population in the state. There are three rather small cities: Kokomo, Vincennes, and Columbus, north, southwest, and southeast respectively from Indianapolis, that are placed in group-3 with wholesale trade of $250 to $400 yearly per inhabitant. The other 26 cities in this study are of minor significance, one, Whiting, having but $17 wholesale trade per inhabitant. For classification purposes group-4 consists of cities with $150–$250, and group-5 below $150 annually in sales per inhabitant.

Indianapolis stands in a class by itself among the wholesale centers of Indiana. The city has 11 per cent of the state's population but all the statistics concerning wholesale trade are much higher than this percentage. Thus there are 846 wholesale establishments in Indianapolis out of 4842 in Indiana, a percentage of 17.5; or sales total $374,483,000 out of $847,035,000, or 44.2 per cent of the state. Employees number 10,056 out of 28,555, or 35.2 per cent. The average wholesale house in Indianapolis

does nearly four times the annual business of the concerns elsewhere in Indiana, the totals being $442,860 for Indianapolis and $118,000 for the cities outside the metropolis. The state average is $175,150.

As might be expected the industrial cities of the Calumet District close to Chicago (Gary, Hammond, East Chicago, and Whiting) are of minor importance in wholesale trade, the four cities having only $33,000,000 in sales yearly, which value is almost attained by Terre Haute (30 million) although that city has only one-fourth the population of the four Calumet towns. Evansville, Fort Wayne, and South Bend each do close to $50,000,000 yearly in wholesale trade. They are all 100 miles or more from Indianapolis and hence far enough distant so that competition from the state metropolis is less dominant than in cities closer to the capital city. The three cities mentioned are also near the border of neighboring states, Kentucky, Ohio, and Michigan respectively, and their wholesale territory extends across the statelines. Terre Haute, the fifth city in value of wholesaling has the same advantage of some out-of-state business from Illinois. The next cities in value of wholesale trade are Gary (whose sales are small compared to its population), Richmond, and Kokomo. These cities have 11 to 14 millions in yearly sales. Kokomo is about midway between Indianapolis, Fort Wayne, and South Bend. Richmond is close to the Ohio line and at the edge of a triangle between Cincinnati, Fort Wayne, and Indianapolis. It is evident that to become an important wholesale center a city should be at least 75 miles from a dominant wholesale metropolis in order to have a sufficient trade territory in which competition from the big wholesale city will not be too much for the smaller town. Thus cities within 50–60 miles of Indianapolis are of small significance in wholesale trade, for example, Anderson, Bloomington, Columbus, Crawfordsville, Elwood, Frankfort, Logansport, Muncie, Newcastle, and Shelbyville. Elsewhere in the state Michigan City, Mishawaka, Jeffersonville, and New Albany are in a similar situation towards South Bend and Louisville as the other places are to Indianapolis, and are of less importance in wholesaling than their population would seem to warrant. On the other hand, Lafayette, Elkhart, and Vincennes are located sufficiently far from competing cities so that they are quite important in wholesaling relative to their population. Marion would seem to be far enough distant from competing cities to permit its becoming a wholesale center, but actually, like Muncie, the place is more noted for industry than for wholesaling. Probably human factors largely account for the different lines of business in these Indiana cities.

In general, the sales per wholesale establishment decrease with the population although some exceptions occur. Thus Richmond, Kokomo, Elkhart, and Lafayette, all good wholesale cities in the 20–50,000 population class have $160,000 to $199,000 in sales per establishment, while the average for that size city is only $136,000 yearly, and sales in the 10–20,000 population class cities approximate $100,000 per establishment. In this smaller population group Connersville, LaPorte, Peru, and Vincennes rank best among the 15 cities with an average of close to $165,000 per establishment annually. These four cities are located at railroad junctions far enough from competition to gain a good share of the available wholesale trade. Of course the type of manager in charge of an establishment is a vital consideration in its success but this

personal factor was not evaluated in this study.

MANUFACTURING

In this study, cities with over $1,000 of manufactures per inhabitant yearly were classified in group-1, those with $500 up in group-2, over $300 in group-3, and under $250 in group-4. To avoid disclosing information about individual establishments in cities where one or two plants dominate the industrial life, the census withheld the value of products for ten cities in Indiana. For purposes of comparison the writer took the number of wage earners in each of the ten centers and multiplied by the average value of products in the state per wage earner ($8,029) to secure the approximate value of manufactures for each city. Then this total value was divided by the population of the city concerned and the result, the value of manufactures per inhabitant, was used to classify the city. This scheme is believed to give a reasonable approximation for the relative importance of manufacturing in the ten cities: Connersville, Columbus, Fort Wayne, Frankfort, Gary, Jeffersonville, Kokomo, Mishawaka, Newcastle, and Whiting.

The manufacturing centers included in group-1 with an output of over $1,000 per inhabitant annually are: Gary, South Bend, Hammond, East Chicago, Evansville, Anderson, Kokomo, Mishawaka, Michigan City, Muncie, Columbus, Connersville, Newcastle, Whiting, and LaPorte. Of these 15 cities, six are between 50,000 to 120,000 population, four are in the 20–49,000 class, and five have 10–20,000 people. There are ten cities in group-2 ($500–$999): Indianapolis, Fort Wayne, Marion, Richmond, Elwood, Elkhart, Goshen, Crawfordsville, Huntington, and Logansport. Of these Elkhart with $953 per person is close to being in group-1 and is classified as group-1 plus in the table. Group-3 ($250–$500) includes seven towns: Bedford, Frankfort, Lafayette, New Albany, Shelbyville, Terre Haute, and Vincennes. The fourth group consists of three cities: Bloomington ($180) Jeffersonville, and Peru ($200) where manufacturing is a minor factor in the local economy.

A high degree of concentration is found among the manufacturing cities. Of 16 cities, including Elkhart, placed in group-1, nine are in a short strip of northwestern Indiana from the Calumet District east to Elkhart. This is the greatest concentration for industry in the state. The other seven cities are scattered over the central and southern parts of Indiana. Manufacturing cities in group-2 include three cities in the north, four in the central area, and one in the south. Thus 21 out of 25 cities in which manufacturing either leads or is highly important are in the central and northern sections of the state and three cities (Columbus, Richmond, and Connersville) are close thereto. It is of interest that all of these 21 cities are within glaciated areas. Evansville, on the Ohio near the southwest corner of the state, is the only group-1 manufacturing city well outside the industrial north and middle of Indiana. Oddly, Terre Haute is best located for coal of any Indiana city, yet it is in group-3 ($250–$500) in manufacturing. Evidently access to markets, nearness to Chicago or to the Michigan automobile factories, convenience to sources of iron ore from the upper Great Lakes, or of steel from the Calumet District, and the impetus of an early start are of more importance in locating manufacturing establishments than to be in the center of coal and oil fields. Natural gas helped in early days at

TABLE II

CLASSIFICATION OF 35 INDIANA CITIES

City	Population	Retail Trade		Wholesale		Manufacturing		Classification
		Total	Compared to Population	Total	Compared to Population	Total	Compared to Population	
Anderson	3	3	2	4	4	2	1	M
Bedford	4	4	2	4	4	4	3	R (M)
Bloomington	3	3	1+	4	4	4	3	R Univ.
Columbus	4	4	1	4	4	3	1	M.R.
Connersville	4	4	3	4	4	3	1	M.R.
Crawfordsville	4	4	1	4	4	4	2	R.M.
East Chicago	2	3	4	3	4	1	1	M
Elkhart	3	3	2	4	4	4	2	R.M.
Elwood	4	4	3	4	5	4	2	R.M.
Evansville	2	2	2	2	2	1	1	M.R.W.
Fort Wayne	2	2	2	2	2	1	2	M.R.W.
Frankfort	4	4	1+	4	4	4	3	R
Gary	2	2	3	3	5	1	1	M (R)
Goshen	4	4	1	4	4	4	2	R.M.
Hammond	2	2	2	4	5	1	1	M.R.
Huntington	4	4	2	4	4	4	2	R.M.
Indianapolis	1	1	2−	1	1	1	2	W.R.M.
Jeffersonville	4	4	3+	4	5	4	4	Sub.Res.
Kokomo	3	3	2	3	3	2	1	M.R.
Lafayette	3	3	1+	4	4	3	3	R.Univ.
La Porte	4	4	1	4	4	3	1	M.R.
Logansport	3	3	2	4	4	3	2	R.M.
Marion	3	3	1+	4	4	3	2	R.M.
Michigan City	3	3	2+	4	5	3	1	M.R.
Mishawaka	3	4	4	4	5	3	1	M
Muncie	2+	3	2	3	4	2	1	M.R.
New Albany	3	4	3	4	4	3	3	Sub.Res.
New Castle	4	4	2	4	5	3	1	M.R.
Peru	4	4	2	4	4	4	4	R
Richmond	3	3	2	3	3	3	2	M.R.
Shelbyville	4	4	1	4	5	4	3	R
South Bend	2	2	2	2	2	1	1	M.R.W.
Terre Haute	2	2	1	2	2	3	3	R.W.
Vincennes	4	4	1	4	3	4	3	R
Whiting	4	4	3	4	5−	2	1	M

Plus sign indicates center is between its class and next larger.
Minus sign indicates center is between its class and next smaller.
Letter in parenthesis indicates moderate importance.

Legend—M = Manufacturing, R = Retailing, W = Wholesaling.

Population	
Group	
1	300,000–400,000
2	50,000–120,000
3	20,000–49,000
4	10,000–20,000

Retail Trade		
Group	Millions of $ Total	$ Per Person
1	100–200	500 Up
2	30–60	4–500
3	10–25	300–400
4	Under 10	Under 200

Manufacturing		
Group	Millions of $ Total	$ Per Person
1	100–300	1,000 Up
2	30–70	500–1,000
3	10–30	250–500
4	Below 10	Below 250

Wholesale Trade		
Group	Millions of $ Total	$ Per Person
1	300–400	890
2	30–60	400–550
3	10–20	250–400
4	Below 10	150–250
5		Below 150

Muncie, Anderson, Elwood, and other towns, but industries operate mostly on other sources of power today. Only three of the 35 cities are in group-4. One of these, Bloomington, is an educational center, a second, Jeffersonville, is a residential suburb of Louisville, and the third, Peru, is a bigger than usual agricultural supply center and famed as the winter headquarters of circuses.

The statistics of manufacturing for Indiana show essential stability during the decade 1929–1939. The number of establishments decreased in the decade from 4919 to 4337—a decline of 11.8 per cent, but the number of employees decreased only 6.8 per cent, from 340,558 to 318,407 in 1939. In 1937 a maximum employment of 356,923 was attained and during the following war years nearly everyone who was available was employed. Value of products were $2,468,521,903 in 1929, $2,497,548,000 in 1937, and $2,227,648,000 in 1939. The decline of 9.7 per cent during 1939 has no great significance and has been overcome in the years since the last census.

The size of an establishment and the character of product manufactured are of much greater importance in regard to employment and value to a community than the number of factories. As mentioned, to avoid disclosing exact or approximate data for individual establishments statistics are withheld by the census for ten out of 35 cities above 10,000 population in Indiana. Complete comparisons between cities are therefore impossible.

Indianapolis in 1939 had the value of manufactures approximating its per cent of the state's population (12.2 per cent manufactures compared with 11.3 per cent population). In value of products East Chicago in 1939 with 279 millions exceeded Indianapolis with 272 million dollars. However, there were 35,690 employees in Indianapolis and 22,280 in East Chicago—evidence that special products requiring more labor were characteristic of Indianapolis while heavy goods dominate the Calumet cities. Gary had 25,327 persons working in its mills, but the value of products is withheld, although likely it exceeded that of East Chicago. South Bend exceeds and Evansville equals $130,000,000 in manufactures. Hammond with $95,000,000 follows, although if statistics had not been withheld Fort Wayne would likely be in the class with South Bend. Anderson and Muncie have above $60,000,000 in value of manufactures annually. In 1939 Elkhart had $32,000,000 and LaPorte, Marion, Michigan City, Richmond, and Terre Haute were between 21 and 28 millions in manufactured goods. Lafayette, New Albany, and Marion have above $11,000,000. Other cities like Kokomo, Mishawaka, Newcastle, and Whiting would rank well in value of manufactures but statistics have been withheld in order not to disclose the individual output of a concern.

Some conclusions can be drawn from the available information. Indianapolis is preëminently a city of general industry. Meat packing, automotive parts, war goods of all sorts, drugs, fertilizers, canned goods, and scores of other products are made there. In contrast, iron and steel, oil refining, and heavy industries characterize the mills of the Calumet District. Machine products and automobile parts are of much importance through northern Indiana at South Bend, Mishawaka, Fort Wayne, Newcastle, and other towns. In southern Indiana, Evansville stands rather alone. Furniture and wood working establishments are important in numerous centers, like Bloomington, Crawfordsville, Shelbyville, and Fort Wayne. Some specialties may be noted like glass

jars in Muncie and band instruments in Elkhart. Manufacturing in some cities does not rank up to that expected from their population. Among these are Terre Haute with 63,000 people and 27.6 millions output from manufacturing, and Peru with over 12,000 inhabitants and only two and one-half millions value of manufactures. Obviously the support of such centers comes from the importance of wholesale and retail trade or other means. Thus Peru is winter headquarters for traveling circuses and Terre Haute is the center of coal mining in Indiana. Three new powder and ammunition plants at Charlestown, Crane, and Tell City support a large force of workers during the war, but it is unlikely that these and many other defense projects will continue after peace comes, so for the purposes of this study it is probably just as well that lack of statistical information prevents inclusion of such war industries and centers.

NEEDS OF INTER-AMERICAN TRANSPORTATION

Major General Julian L. Schley

Assistant Coördinator of Inter-American Affairs

THIS world war has taught the Americas the bitter lesson that the Western Hemisphere's transportation systems need to be improved for military defense of the hemisphere and for maintenance of essential civilian services. Only by seriously curtailing the civilian economies in the Americas of their normal transportation facilities has the tremendous mobilization of hemisphere economic resources for war been possible.

Today all the American republics stand in need of more transportation facilities. The economic loss to business and trade is serious. War demands on transportation and deterioration of equipment and facilities have contributed to shortages of food and price inflation in many countries in this hemisphere.

The importance of transportation to the American republics is obvious. The improvement of lines of transportation has been studied at virtually every inter-American meeting or conference since the First International Conference of American States at Washington in 1889. The need for improvement and protection of inter-American transportation also was emphasized by the First World War. Since that time the Americas have organized many conferences and commissions to promote land, water, and air transportation.

Much, it is true, has been done in the past to improve and develop hemisphere transportation, but it has taken the kind of a war we are waging today—a total war on a truly global scale in which whole economies as well as populations of nations are involved—to demonstrate the imperious necessity for far greater improvement and development of inter-American transportation for hemisphere defense than was envisaged before the war. Moreover, we in the Americas must face the fact that if postwar world security is predicated on expanded international trade, increased economic development, and higher standards of living, extensive improvement and development of hemisphere transportation will be needed to attain these postwar objectives.

The outbreak of war in Europe in September, 1939, focused attention almost immediately on the vital importance of land, water, and air transportation systems in the hemisphere. The transportation situation became particularly acute in ocean shipping.

Before the war, about a third of the trade of the 20 other American republics was with Europe. Within a short time after the conflict in Europe began, a cancellation of European steamship services resulted as ships were given war assignments or, in the case of the Axis and Axis-controlled countries, became immobilized in ports. The other Americas had to turn to the United States for new markets and for supplies formerly imported in part from Europe.

As United States vessels were withdrawn under the Neutrality Act from belligerent zones, many were reassigned to inter-American shipping routes. As

a result, United States shipping services to the other Americas actually increased temporarily after the beginning of the war in Europe, but the increase of United States and Brazilian shipping and of chartered neutral tonnage only partially offset the loss to the Americas of shipping services for the principal European maritime powers. Moreover, after Pearl Harbor, it became necessary to withdraw most of the best United States ships from the inter-American trade for war tasks. This withdrawal caused a critical shipping shortage which continues as war demands for shipping mount, in spite of the shipbuilding program and the increasingly effective protection against the Axis submarines.

In the field of air transportation, the Americas had become alarmed even before the outbreak of war by the fact that there were more than 10,000 route-miles of completely Axis-controlled airlines in South America. In April, 1941, an organization was established by the United States Government to help replace these Axis-controlled airlines. This change was brought about through the coöperation of many of the American republics and by means of technical and material assistance provided by the United States through the American Republics Aviation Division of the Defense Supplies Corporation.

Withdrawal of passenger ocean liners from the sea lanes between the Americas for war assignments and increased submarine attacks on shipping diverted passenger traffic to the inter-American commercial airlines, taxing their capacity. Demands for passenger, air express, and air cargo space continue to be far in excess of space available on commercial transport planes, although considerable improvement has taken place in recent months by supplying more planes to the inter-American air carriers.

In contrast with the improvement in recent months in inter-American air transportation, rail and motor transport has become more acute recently. All American republics are experiencing increasing difficulty in keeping their rail, bus, and motor truck services in operation because of the deterioration of equipment and facilities, the difficulty of obtaining replacement materials and spare parts, and fuel and tire shortages. Impairment of rail and motor truck service has contributed in large part to shortage of food and rising prices because of the difficulty in moving foodstuffs to markets.

The Office of Inter-American Affairs in August, 1944, raised its Transportation Division to the status of a Department within the Office because of the importance of coöperating with the other American republics in keeping transportation systems operating as efficiently as possible. The Department supplies technicians to advise American Republics on maintenance and operational methods, in collaboration with the Department of State, War Shipping Administration, Civil Aeronautics Administration, Office of Defense Transportation, Foreign Economic Administration, Army, Navy, and other agencies.

The most extensive program so far undertaken in connection with transportation by the Department of Transportation of the Office of Inter-American Affairs has been the United States Railway Mission sent to Mexico. This Mission is assisting in the rehabilitation of certain key lines of the National Railways of Mexico to help the railways carry such strategic materials as lead, zinc, antimony, and copper. Under this program a large number of Mexican National Railway mechanics are being trained in railroad shops in the United States. The Office of Inter-American Affairs has also sent railway missions to

Bolivia, Ecuador, and Colombia to counsel and advise on railway matters. Highway transportation advice has also been given by United States technicians of the Office of Inter-American Affairs in Mexico, Central America, Peru, Colombia, Venezuela, and Paraguay. The Office's Department of Transportation has provided consultative assistance to other American republics in the fields of air transportation and ocean shipping and has sponsored the training of civil aviation personnel from the other Americas both in the United States and in their own countries.

Recently the Inter-American Defense Board made public a report by its committee on inter-American transportation which not only frankly reveals the deficiencies of hemisphere transportation systems but also makes valuable recommendations for their correction. A resolution adopted on the basis of this report contains many of these recommendations, including the proposed creation of an Inter-American Office of Transportation to coördinate all the inter-American agencies and congresses at present concerned with transportation, including transportation experts of the armed forces. This resolution has been forwarded by the Defense Board to the Governments of the American Republics.

The Inter-American Defense Board, it will be recalled, was created in March, 1942, its charter having been contained in the resolutions of the Third Meeting of American Foreign Ministers held at Rio de Janeiro in January, 1942. It is composed of delegations of army, navy, and air officers from the American Republics. Its duties are to consider measures necessary for the defense of the continent. Its committee on inter-American transportation, appointed on January 10, 1944, comprised the following delegates: Major General J. C. Ord, United States, chairman; Colonel Juan Jones-Parra, Venezuela; Colonel Armando Revoredo, Peru; Colonel Stenio Caio de Albuquerque, Brazil, and Lieutenant Guillermo Hernandez Sagarra, Mexico.

Although the Inter-American Defense Board's resolution and accompanying report admittedly are concerned primarily with the military needs of hemisphere transportation, its findings and recommendations are pertinent to postwar civilian needs for improved hemisphere transportation. The postwar plans to increase inter-American trade and to open up undeveloped areas in South America will result in greater demands on transportation systems than the traffic they carried before the war. Furthermore, when the war ends, we may expect tourist travel among the Americas to be resumed on an increasing scale.

The resolution and accompanying report also contain recommendations concerning standardization of transportation equipment, including railway track gage, cargo-loading and aviation ground installations, and also flying equipment, which hold important implications for manufacturers of land, water, and air transportation equipment. For example, the building of railway track in two gages only—U. S. standard gage and one-meter gage—is recommended in the resolution. At present there are 10 different gages of railway track in Latin America's 88,000 miles of railway.

The resolution on transportation adopted by the Defense Board declares that (1) "the maintenance of an adequate and efficient ground, water, and air transportation system is vital to the security of the Western Hemisphere" and (2) "in planning the development of transportation in peacetime it is necessary to consider military require-

ments and to provide for such measures as will assure service as nearly adequate as possible during emergencies."

"The Inter-American Defense Board," the resolution continues, "resolves:

"1. To recommend to the American Republics that they continue their efforts toward improvement and integration of their ground, water, and air transportation systems.

"2. To recommend to the American Republics that their joint efforts toward improvement of transportation be duly coördinated, and that an Inter-American Office of Transportation be created to coördinate all the inter-American agencies and congresses which are at present concerned with this subject, including transportation experts of the armed forces. Such an inter-American organization should not, of course, be inconsistent with the establishment of a general international organization in this field.

"3. To recommend to the American Republics that in their plans for the development of transportation, the many specific suggestions for improving the military efficiency of the Hemisphere transportation system mentioned in the report which accompanies this resolution, but not included herein, be adopted by the Republics and pushed to completion at the earliest practicable date." Among these specific items the following are particularly emphasized from the point of view of Hemisphere defense:

"(a) Standardization of transportation equipment and operating procedures, including cargo-handling machinery at terminals and particularly railroad gages, adopting the standard gage (4 feet 8½ inches) as a primary gage and the one-meter (3 feet 3⅜ inches) as a possible alternate;

"(b) Availability of sufficient merchant shipping to meet any emergency and to support the naval forces, which could be provided through:

"(1) The maintenance of the largest profitable number of Hemisphere-flag ships in operation;

"(2) The maintenance of an adequate reserve of ships, inactive in commerce but in readiness for use; and

"(3) The preservation on a stand-by basis of enough shipyards to guarantee quick resumption of large-scale shipbuilding, if needed;

"(c) Development of civil airways along the lines of the strategic air bases now in existence or projected, where such development is practicable;

"(d) Freedom of transit and technical stop for civil aircraft and emergency stop of military aircraft of the American Republics for repair and fuel;

"(e) Full exchange of weather information, unifying the procedures for collection, evaluation, and dissemination of weather reports; and

"(f) Establishment of inter-American institutions to give complete training to flight and ground crews, including pilots, navigators, radiomen, weather observers, mechanics, engineers, communication experts, and all other personnel required to operate a Hemisphere system of airways, in order that such personnel may be qualified under uniform standards of competency and be indoctrinated in the military features of air transportation.

"4. To recommend to the American Republics that they recognize the need of supporting through direct subsidies or other open and non-discriminatory means any transportation facilities which, while not commercially self-supporting, are nevertheless necessary for the defense of this Hemisphere, con-

sidering such support as a wise investment in their joint security."

The report that accompanies the resolution points out that the Third Meeting of American Foreign Ministers held at Rio de Janeiro a few weeks after Japan's attack on the United States made a comprehensive recommendation in its Resolution IV, "Mobilization of Transportation Facilities," for the improvement and development of transportation resources in this hemisphere. "Although adopted under the pressure of a sudden attack, it is still applicable today and doubtless will continue to be applicable in the postwar period," the report says of this resolution of the Rio de Janeiro conference.

Attention also is called in the report to the five recommendations on transportation made by the delegates at the First Conference of Commissions of Inter-American Development held in May, 1944, at New York City. "These recommendations, which include a proposal for an Inter-American Transportation Congress, are commended as meriting the sympathetic and energetic support of the American Republics," the report states.

Discussing hemisphere transportation requirements, the report reads as follows:

"Land, water and air routes developed to meet commercial needs will continue to form the backbone of future military transportation in the Americas. It is essential, however, that the possible military needs be kept in mind during the development of these commercial routes and that, where absolutely necessary, the commercial routes be supplemented by routes which are primarily required for military purposes.

"It is also essential that a hemispheric point of view be adopted in planning for the future, so that a single integrated transportation system may link all the American hemisphere. It is desirable that land, water, and air routes be mutually supporting so that no part of the hemisphere may have to depend upon a single form of transportation, no matter how well that single form may be developed. Only thus can the Americas reduce to a minimum the improvision and expansion necessary when their peacetime transportation system is called upon to meet wartime requirements."

The report's observations on standardization are also a significant contribution to future improvement and development of hemisphere transportation.

"Standardization of transportation equipment," the report declares, "is important in peace, but essential in war. The hemispheric transportation system should be standardized in order to reduce the cost of development and maintenance, to promote operational efficiency, to eliminate structural and mechanical obstacles to the movement of conveyances, and to assure the ready replacement of equipment in any emergency.

"In adopting standard models and designs, the Americas should be guided by two considerations: the need to keep conversion at a minimum by utilizing as much as possible of the present system, and the need to guarantee maintenance and replacement under any conditions by employing supplies and equipment available from manufacturers in this hemisphere. The peacetime requirements for money invested in spare parts and reserve equipment, and the wartime requirements for materials committed in such extra equipment, would be reduced to a minimum by standardization.

"In view of the military advantages of standardized material produced in this hemisphere, the producers should study the financial capacities of the various American Republics and make

financial arrangements which can be met by these nations. Standardization would be more feasible if the prices, conditions of payment, and quality could compete advantageously with what might be offered from outside the hemisphere. In furtherance of the policy of common use of facilities available for a joint defense, which may even envisage the use of joint forces, we should begin by fixing standard types for the most important items of equipment to transport the loads (including motive power), road and railroad building machinery, and cargo handling machinery at terminals."

The report takes up specific items for standardization in the fields of land, water, and air transportation. In the case of railways, the report declares there is great need for standardization of trackage, rolling stock and repair and service facilities. It points out that of the 10 different gages used in 88,000 miles of railways in Latin America, 20,511 miles (23.46 per cent) are of U. S. standard gage and 34,095 miles (39 per cent) are one-meter gage.

"It would, therefore, be of great value to unify the present diversified trackages in one or at the most two gages," the report continues, "with the so-called standard gage of 4 feet 8½ inches (1.4351 meters) as a primary gage and the one-meter (3 feet 3⅜ inches) gage as a possible alternate. It should be noted that there are now 7,776 miles (8.89 per cent) of three-foot gage trackage in Latin America, and that the difference between this and one-meter gage is so small that there would be a minimum of problems in converting the track and adapting rolling stock.

"Locomotives should be reduced to the minimum number of types and these should be standardized for the Hemisphere. Both major sub-assemblies and individual parts should be standardized as much as possible in all types to permit interchangeability. As regards railway cars, the carriages, brakes, couplings, and height of couplings are some of the principal items for standardization. Where complete standardization is not possible, standardization of parts can be used as a partial substitute and it is suggested that railway experts should set up the required and practicable limits of standardization. Another very important item is clearance in railway passages and tunnels, over and underpasses. Minimum clearance should be provided to allow passage of all types of equipment. Lastly, standardization of railway signalling and switching equipment is also very important.

"In the matter of repair and service facilities, the idea would be that these be so standardized that a train moving from one end of the Continent to the other could be serviced quickly and efficiently at any point."

In the field of motor transportation, the report suggests that a great degree of standardization could be obtained in the trucks and trailers which form the backbone of the motor transportation system. It urges that characteristics of military vehicles be borne in mind in building highways and bridges.

"The physical equipment of the ground transportation system," the report continues, "should be supported by technical and administrative organization designed to make the most efficient possible use of the system. Such organization should include inter-American agreements to eliminate all unnecessary formalities and facilitate the movement of rail and highway traffic in times of peace, together with advance agreements to permit instant mobilization of the entire Hemisphere's transportation resources in case of emergency. It should provide for the inter-

change of information and for the training of personnel. In the field of highway transportation it should provide standard traffic codes and highway marking symbols."

In the field of ocean transportation, the report states that ocean-going vessels do not lend themselves as easily to standardization of models and parts as automotive, rail, or air carriers, yet a certain degree of standardization is necessary for maximum operational efficiency. Pointing out that much of the increased speed of new freighters is being offset by delays and difficulties at some ports, the report recommends that modern standard loading and unloading equipment and methods should be employed and port formalities should be simplified wherever possible. It says other forms of standardization should include the adoption of a uniform system of measuring the cargo space available in ships.

In discussing standardization in air transportation, the report recalls that, when the war in Europe suddenly shut off the flow of replacement parts for European-made aviation equipment in Latin America, some of the routes formerly using Axis personnel or equipment were taken over by Hemisphere-controlled airlines, while others soon were abandoned as their equipment wore out or became useless. "Therefore it is suggested," says the report, "that airlines consider the actual long-term economy as well as the military desirability of adopting high-quality equipment which will always be available in this Hemisphere." The report then goes on to assert that the advantages of standardization, while great in any form of transportation, are of supreme importance in aviation.

"Since the needs of a single modern air force may require that as many as 150,000 different items of maintenance parts be kept in stock at major bases," the report continues, "it can readily be seen what problems would be created by future development of our air transportation systems with equipment as diversified as was used before the war. Yet while the necessity for standardization of both ground installations and flying equipment is evident, it should nevertheless be emphasized that standardization must be flexible and not restrictive, allowing for the rapid and complete adoption of improvements in aviation and allied fields. With this qualification in mind, the American Republics should work toward the greatest feasible standardization in their air transportation system, determining first the most practical types of aircraft for every purpose. The aircraft chosen will in turn set the pattern for standardization of service and repair facilities, and economy as well as efficiency will favor the standardization of weather observation, navigation, and communications equipment not directly related to airplanes."

In addition to these recommendations already mentioned, the report contains many equally valuable suggestions concerning problems of ownership and control, organization, training, fuel, pipelines, maps, inland waterways, and world ocean trade routes.

Because water transportation is at once the most important and the most vulnerable of the links among the Americas, the report stresses the necessity for the controlled development of great ocean trunk lines along the principal inter-American trade routes, with the shipping services on these trunk lines supplied, so far as practicable, by ships flying the flags of the American republics. It further urges that the American Republics work together and with other nations of the world to make sure that the merchant marines of the

Western Hemisphere obtain their fair share of trade over world routes in order that larger active merchant marines may be maintained than could be supported by inter-American traffic alone. These extra ships, it points out, could always be diverted to inter-American routes in case of emergency.

The advantages of full participation in world shipping are, the report states, equally applicable to air transportation. Hence, it says, the nations of this Hemisphere should extend their cooperation into the field of international agreements covering world air transportation, standing together to assure the American Republics their fair share of world air routes.

From this short review of the Inter-American Defense Board's report and recommendations on hemisphere transportation, one can see that many economic benefits would result from carrying out these recommendations, of which some require governmental action and others the action of private enterprise. Some recommendations concern improvements which can be accomplished almost immediately, other recommendations concern improvements which will undoubtedly have to be postponed until after the war when equipment and manpower again become available.

Important progress toward standardization and integration of air transportation in the Western Hemisphere was made at the recent International Civil Aviation Conference at Chicago. The United States and many of the American Republics have signed agreements not only providing for freedom of transit and non-traffic and technical stop for civil aircraft, as recommended by the Defense Board, but also for freedom for commercial air carriers to take traffic to and from the homeland, and to pick up and discharge traffic at intermediate points (but not to carry traffic between two points within a country). The matter of military aircraft by agreement was not within the scope of the Conference as this type of aircraft will be under the jurisdiction of the proposed international security organization.

It was agreed at Chicago that each nation will give the technical annexes drawn up at the Conference such measure of immediate application as it might find practicable. Some details have been left for later revision and provision has been made for later amendment. But, in the main, the annexes on technical standards and procedures have carried world airline operations a long way toward standardization and uniform operation for the safety and convenience of world air traffic.

The Interim Council of this world aviation organization is also authorized, if a country so requests, to provide, man, maintain, and administer facilities required for airline operations across the country. The articles of the Convention of International Civil Aviation further provide that a State may buy back facilities built by the Council and that when such facilities are bought back, the Council will return funds to the States which advanced money for the original construction.

The Inter-American Defense Board and its committee on inter-American transportation are to be commended for the scope of their vision and the thoroughness of their studies of hemisphere transportation. These army, naval, and air technicians of the armed services of the 21 American Republics have made a most valuable contribution to hemisphere thinking and planning in connection with transportation. The fact that their undertaking was a cooperative venture demonstrates once again the validity and merit of the inter-American concept of cooperation for the general welfare of all.

When the Americas were faced with the gravest menace to their freedom since they became independent nations, the importance of transportation and transportation installations, particularly on the "bulge" of Brazil and in the vicinity of the Panama Canal and the Caribbean, was all too real. Much has been done to improve transportation insofar as hemisphere military security is concerned. Looking to the future, those technicians who have been studying hemisphere transportation needs believe that if the peacetime objectives of expanded international trade, economic development, and higher living standards are to be attained, the importance of hemisphere transportation improvements is equally real.

However, the Americas have shown what they can do, through joint effort, in mobilizing their tremendous resources for wartime needs. Though the challenge that lies ahead in the field of transportation is formidable, the Americas can, by working together in the inter-American spirit of coöperation, make further progress in the field of transportation, as they have done in so many other fields. An integrated transportation system would contribute immeasurably to hemisphere solidarity, prosperity, and security.

RENAISSANCE OF ICELAND

W. R. Mead

ICELAND is enjoying a renaissance. Its new relations in the northern hemisphere have invested it with particular importance. In isolation, the island has little significance. But, as world distances have telescoped, Iceland has benefited from opportunities and contacts—both new and renewed. It has more than its share of geographical limitations; but they are being overlooked in the face of increasing possibilities. And, increasing contacts with the broader world scene have meant improved conditions at home.

The renaissance is a result of outside forces. The effects of new strategic interpretations are seen most clearly in Iceland's expanding trade. For the island's commerce, in addition to being a simple response to the domestic background of a North Atlantic outpost, is also a complex development resulting from successive interpretations given in world history to North Atlantic geography. Its trade is a piper for which geography has called the tune and history supplied the harmonics. Overtones, for Iceland, were never richer than today.

This is a renaissance for two reasons: First, Iceland has lived before in a similar network of routes and relationships. Colonized by recalcitrant Norse and scattered British immigrants, it became pivot of the early sub-polar Danish Empire and natural stepping-stone on the adventurous North Atlantic route to Vinland. Its world position was almost as positive a reality in the geography of Viking times as it is in that of modern Europe. Secondly, Iceland has known an earlier summit of independent development when Atlantic forces transcended Scandinavian controls. After the break-up of Scandinavia's early Atlantic Empire, Iceland capitalized on physical insularity. In its splendid isolation, it embarked upon a precocious development which brought a prosperity unparalleled until modern times. Recrudescence of Denmark's "Empire of the Sea" brought Iceland, once more, under control of the mainland. As a colony held in restraint by Denmark's monopoly and exploited for imperial revenues, it declined. Mediaeval coastwise sailing made Vinland seem a remote legend. With the geographical unity of the Atlantic forgotten, Iceland became a terminus in the web of trade and lost its function as maritime crossroads.

There have been two stages in Iceland's renaissance. Rediscovery of the Americas was first. But, for four centuries after the reopening of trans-Atlantic trafficking, shipping routes avoided North Atlantic waters. The present generation, with its appreciation of sub-polar and trans-polar routes, announces the second stage. Instead of living on the circumference of (what mediaeval geographers called) "The Outer Ocean," Iceland is again being brought into the midst of world movement. Furthermore, historical circumstances, reasserting the Atlantic force over that of the mainland and divorcing the island again from the continent, have once more brought this thousand-year old polity to complete and independent statehood.

Iceland lives by trade. Because geography calls the tune, independence only

has meaning in a regime of free and uninterrupted international exchange. Consider the background. Although Iceland is two and a half times the size of Denmark and, after Great Britain, is largest island in Europe, it has conspicuously little cultivated land. There are no satisfactory constructional materials (wood, clay, metals)—save inaccessible building stone. The use of glacial boulders for structural foundations and employment of grass turves for roofing in country districts illustrates this. The island is void of combustible fuel (coal and oil). It is a land unfavourable to agriculture—less on account of inclement winters and length of growing season than of unfavourable summers. Only a half per cent of the surface area is therefore cultivated. Sheep rearing continues to be the main rural pursuit. Production of hay—the chief crop—limits numbers of cattle. Cereals will not ripen. To multiply points of contact with a niggardly natural environment, Iceland looks seaward. Sebastian Munster's early sixteenth century "Cosmographia" engraves the arms of Iceland as a crowned fish. Iceland lives by exchanging the products of the sea by way of the sea. Moreover, physical factors facilitate trading. A richly indented coastline offers maritime accessibility. A warm Atlantic current guarantees continuously ice-free harbors. As with Norway, Iceland's trade is not subject to seasonal moods. It contrasts with its continental counterpart—Finland—trade of which is concentrated into the summer and autumn months because of Baltic Icing. This is the physical side of independence.

There is also a political side. Though Iceland has always been gathering ground for Polar-Atlantic fish harvests, it has not always been able to benefit

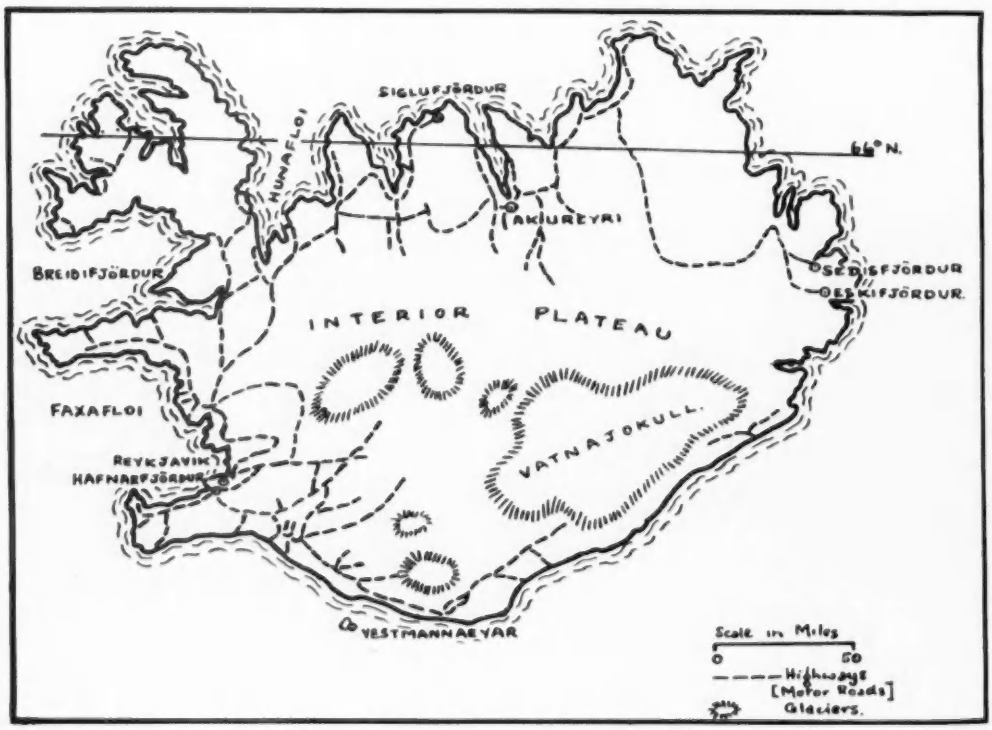


FIGURE 1.—Iceland and its ports which are mostly fiords. Note their back country communications and their land links with each other.

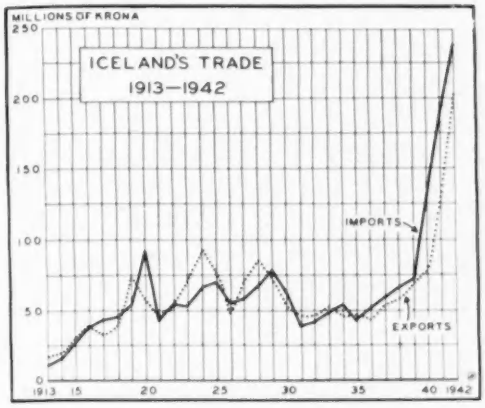


FIGURE 2.—Graph of Iceland's trade.

as a regional focus of shipping. Once the early age of Atlantic independence came to an end, Iceland's export trade was turned to Denmark's advantage. For over four hundred years a thousand-mile distant authority denied Iceland's freedom of exchange and diverted revenues from amelioration of life in this Arctic dependency. Historical records tell of varied and cosmopolitan shipping continuously piloting Icelandic waters. From Norman times onwards, Catholic Europe—saving flesh and setting fishers to work—sent armadas to net its grounds. Is there not recalled in "The Libel of English Policy" (1437) the rivalry between East Coast and West Coast ports of England in Icelandic trade? Mr. Anthony Parkhurst, in a letter to Hakluyt (1578) mentions 100 sail of Spaniards, 20 or 30 Biscayans whaling for oil, 50 Portuguese wet fishing, 150 sail of French and 50 English boats in Icelandic waters. It was a representative sample. Sixteenth century "pêcheurs d'Islande" improved cartographical ideas through their charts e.g. Dieppe school of mapmakers. Danish merchants, harassing these intruders, drove them to the newly-discovered Newfoundland grounds. Iceland's West Atlantic rival supplied the British exchequer with £400,000 p.a. at the time of the Restoration. Danish short-sightedness reduced Iceland to what Sir Joseph Banks called "Egyptian bondage" in the eighteenth century. It was estimated that revenues to the Danish crown did not exceed 4,000 Rixdollars p.a. at the time of the Napoleonic continental system. Only the extreme delicacy of European adjust-

FIGURE 3.—Akureyri is the principal northern township of Iceland. It has a fiord-head situation and shares with Siglufjordur the trade of the northern part of the island. (Courtesy Information Bureau, Reykjavik.)

ments prevented Britain from following up the bombardment of Copenhagen with the annexation of Iceland. Although Danish controls relaxed in the nineteenth century, Iceland took up the challenge of political independence. It provided a kind of complement to the physical challenge. The two have, in fact, been interdependent. In meeting them, Iceland has employed all of the technical means which have modified twentieth century geographical relationships.

The pattern of trade woven into a regime of liberal trading reflects an exclusively fisher-farmer community. Fully 95 per cent of the present exports are products of the sea. Approximately four per cent are products of the farms. Because of the limited variety of production, any renaissance could only serve to exaggerate the importance of maritime products in the export table. Before 1914, a full 20 per cent of Iceland's exports came from the land. Increased consumption of farm products in the expanding home market disguises increasing agricultural production when trade figures are considered. Table I shows the composition of exports from sea and farm over recent years. Prices have naturally mounted with wartime conditions; but there is, nevertheless, marked increase in real output. The table reveals a progressive decline in the proportion of dried and cured fish exported. Exports of fish on ice or fresh fish, as well as fish derivatives (e.g. oil and meal), trend upwards. In the early years of the century, whaling accounted for 17 per cent of export products. Norway also maintained whaling stations on the island. Because whaling has shifted from Arctic to Antarctic waters the industry is no longer important.

Processed products claim an increasing share in farm exports. A flock of half a million sheep is principal source of the island's meat supply and of exported skins. The island has a flourishing glove industry and candle factory.

TABLE I

THE STRUCTURE OF THE EXPORT TABLE

Product	*1936*	*1937*	*1938*	*1939*	*1940*	*1941*	*1942 Jan.-Nov.*
PRODUCTS OF THE SEA							
Clipfisk	11,555	12,339	10,245	10,551	15,161	6,031	3,930
Salt fish	2,888	3,670	6,973	6,546	4,828	16,481	7,283
Fresh fish	4,603	4,785	5,732	8,925	67,741	106,279	122,236
Stockfish	316	455	283	483	494	1,180	805
Herring, cured	6,890	5,833	9,514	11,661	2,759	6,267	4,029
Cod liver oil	3,590	4,145	4,039	5,729	13,188	20,125	18,328
Red fish oil	589	330	...	...	...	...	...
Herring oil	5,127	8,698	5,234	6,297	12,653	14,247	20,979
Herring and fish meal	3,649	6,585	4,722	7,195	9,320	7,295	8,364
Roes salted	505	775	745	761	277	501	50
PRODUCTS OF THE LAND							
Salted mutton	747	794	908	1,131	294	17	...
Frozen mutton	1,838	2,213	2,412	1,863	1,832	26	37
Wool	1,878	2,955	1,415	2,096	743	2,873	337
Sheep skins	2,078	2,732	2,972	3,553	1,677	4,909	5,294
Fur skins	...	...	...	...	265	612	845

Value in 1,000 Kronur.
Compiled from annual *Verslunarskyrslur* published by Icelandic Bureau of Statistics in Reykjavik.

FIGURE 4.—The small port of Vestmannaeyjar is perfect illustration of an Icelandic fisher-farmer community. (Courtesy Isafoldarprentsmidja H.F. Reykjavik.)

Coöperative dairies process the products of 36,000 cattle: while a recently established shoe industry produces 100,000 pairs annually. Icelandic ponies, of which there are stocks approaching 50,000, were once exported in large numbers to English mines. They are an essential for domestic communication. In contrast to Denmark, pigs and poultry are less important in the farming scene. As with Newfoundland and Prince Edward Island, fur farming is a developing industry. Silver fox, derived from Norwegian stock, are most profitable—ironic contrast with the early eighteenth century when foxes were principally notorious for plaguing the sheep runs!

Iceland's dependence upon fish exports compares with Finland's dependence upon forest products. But the variety of derived products which can vary Finland's export structure is not repeated in Iceland's fishing industry. Moreover, the natural wealth of the fishing grounds, shared internationally (and, therefore, Icelandic mostly in name only!), is less tangible than Finland's forests. Finland's mercantile marine serves its timber and allied trades: Iceland's is oriented to the fishing industry. It totals some 40,000 tons. Of the 426 vessels which it included in 1942, 403 were fishing vessels. The bulk of foreign shipping visiting Icelandic harbours is British. Vessels of the Scandinavian countries equalled British tonnage in pre-war years (Norwegian carrying trade). German tonnage equalled a quarter of Britain's total. It has been replaced by American shipping.

What do ships of trader countries bring to this Ultima Thule of the ancients? The variety of products which they bring sets the import tables in strong contrast with the export tables. Consider Table II which shows the

FIGURE 5.—Siglufjordur, on a northern inlet, is the center of Iceland's herring fisheries and seat of processed products. (Courtesy Isafoldarprentsmidja H.F. Reykjavik.)

principal imports into Iceland in 1942. In respect of bulk tonnage, fuels and combustible materials outweigh all others. Alternative means of heating and lighting are available; but Iceland's needs as shipping centre and refuelling base must still be met. As a treeless island, Iceland contrasts with its Scandinavian associates and makes up this deficiency from their generous stores. Like them, however, it is rich in hydro-electric power resources. Electrification of the countryside proceeds apace. It reduces relative demand for coal and oil; but forces up import of electrical machinery. As a land of fire (as well as ice), Iceland also employs the waters of its hot springs. Not only are they a natural source of heat for thriving greenhouse production (Figure 8); for, conduited to the capital, they are a means of extensive central heating. Given postwar air transport, it is hinted that Iceland's greenhouses could serve Scottish cities with flowers as fine as those which the Riviera exported to pre-war London! Meanwhile, more practically, they provide fruit and vegetables for war-time diet.

"Eremeum in Oceano"—the Desert in the Ocean—Celtic anchorites called Iceland. The cold desert—or tundra—it is more appropriately named today. But, through the ocean the cold desert is being changed. The needs of agriculture, as already mentioned, have greatly increased over the last generation. Additional to animal foodstuffs, fertilizers—especially sulphates—and constructional materials: galvanized zinc, iron pipes, etc. for farm buildings (Figure 9), bulk in the import table. Agricultural machinery claims a more prominent place and it is the needs of the farming community which encourage import of motor vehicles into this railwayless country. In 1941, there were 1300 cars and omnibuses in the island, despite poor roads. The import table records also a notable percentage of high quality clothing. Outstanding among non-metallic imports are salt (for the fishing industry) and cement (Aalborg, most important Danish port for Icelandic trade, is also seat of Jut-

TABLE II

PRINCIPAL IMPORTS INTO ICELAND

	1942 Jan.–Nov. (1,000 Kronur)
Textiles	36,390
Electrical machinery and transport goods	34,126
Foodstuffs, tobacco	29,661
Fuels and combustible products	27,046
Clothing and fabrics	25,256
Metal and metal products	23,314
Wood and wood products	16,306
Nonmetallic mineral products	14,149
Chemical products	12,815

TABLE III

TRADE OF PRINCIPAL PORTS

	Imports (in 1,000 Kronur)		*Exports*	
	1936	*1942 Jan.–Nov.*	*1936*	*1942 Jan.–Nov.*
Reykjavik	29,091	221,480	27,103	133,910
Hafnarfjordur	687	4,377	482	. . .
Isafjordur	1,230	1,966	282	7,814
Siglufjordur	1,727	1,957	8,517	20,208
Akureyri	3,210	9,549	1,160	2,125
Seydisfjordur	361	223	538	893
Neskaupstadir	259	241	295	1,938
Vestmannaeyjar	1,376	3,820	2,220	10,912

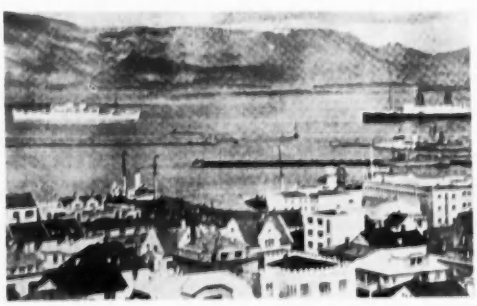


FIGURE 6.—Reykjavik roads are overlooked by Esja Mountain—an Arctic table mountain, typical of the plateau back-country to Iceland's ports. (Courtesy Information Bureau, Reykjavik.)

land's most productive cement plants). To balance the deficiencies of the cold desert, imports of foodstuffs, with cereals and corn products foremost, are made. Wheat flour and maize (for fodder), other grains (for poultry), and sugar are also important constituents. The complex picture provides humorous contrast with the simplicity of imports—"Wood, biscuits, meat, brandy, hats"—listed in an early nineteenth century pamphlet.

Visible indication of the renaissance is the tenfold increase in Iceland's trade during the first quarter of the twentieth century. Admittedly, the figure represents only a microscopic contribution to world export trade; but the .05 per cent (1936)—in value £2.2 millions—meant, in terms of value per inhabitant, £19.1. This figure was exceeded only by New Zealand (£28.6) and approached only by Canada (18.8£). It is, in addition, a trade which keeps a remarkably even tenor in its balance. Figure 2 illustrates this point. Intensification of the island's trade is closely related to opening-up of Iceland's back country. By liberal contact with the outer world it escapes more completely from its world isolation with each successive year. Internal development is, of course, reflex to external association. Therefore, in spite of suffering Europe's largest glaciers, extensive boglands, profitless lava plains, and tundra wastes, Iceland is slowly knitting itself together. The war years have furthered almost every aspect of this process.

Iceland, in fact, is escaping from an old set of geographical limitations through a new set of geographical relations. War has only served to speed this up. It has divorced the country more completely from Europe than at any time since 1807. On this occasion, however, it has not left the island of "stranger-friends" in stagnant isolation. Table IV shows the directional

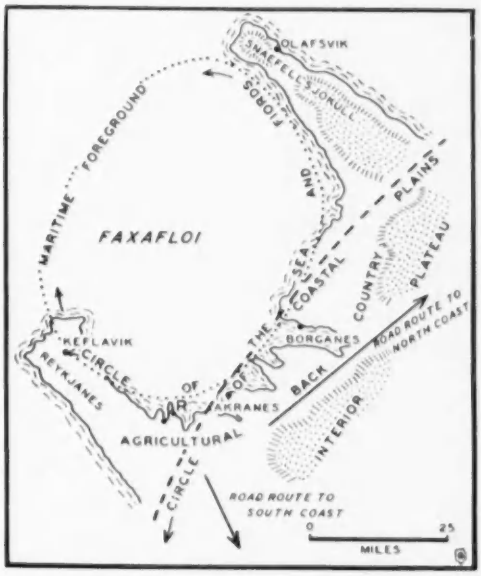


FIGURE 7.—Reykjavik commands the most important of Iceland's "West Firths." For almost 1000 years it has held undisputed leadership in Iceland's trade.

changes in Iceland's trade over the last decade. Great Britain has persisted as chief source of import, with Germany its principal competitor (The harmonics of history, once more! Jon Espolin records a toussle between British and Hamburg merchants in Hafnarfjörd in 1518. Did not Henry VIII endeavour to buy Iceland from Christian III in the same year and Hamburg to acquire it in the 1530's?) Denmark, Britain's chief rival in the 1920's, took third place. Furthermore, all three countries have acted as entrepôts as well as exporters of manufactured products and sources of raw material. It is interesting to see Italy figuring so persistently in Icelandic trade tables. Viking longboats of ancestral Norsemen made landfall of Italian coasts. Iceland, however, knew more personal contact with America. The renaissance of Iceland is nowhere more striking than in its new relation to North America. With Germany excluded, the United States is second source of Icelandic im-

TABLE IV

PATTERN OF ICELANDIC EXCHANGE

A. IMPORTS

	1936	1937	1938	1939	1940	1941	1942 Jan.-Nov.
Denmark	6,699	7,424	6,725	12,638	3,948	54	.
Great Britain	10,019	13,505	14,000	13,785	33,832	85,436	111,623
Germany	9,488	10,843	11,710	10,125	419	13	.
Norway	2,877	4,851	4,213	5,601	2,489	90	.
Sweden	4,469	4,878	4,371	4,642	1,212	15	.
U.S.A.	536	846	644	2,300	19,706	23,896	78,543
Italy	2,291	4,391	4,320	5,307	3,381	61	.
Spain	1,710	255	4,371	4,642	1,220	82	604
Portugal	305	169	318	73	683	1,001	337
Canada	68	78	81	330	2,529	10,957	16,620
Venezuela	. . . .	. . . .	. . . .	. . . .	. . . .	2,554	3,949

B. EXPORTS

Denmark	3,578	5,139	5,229	7,687	3,391	.	.
Germany	7,432	11,048	8,770	7,488	. . . .	.	.
Great Britain	6,971	10,239	11,823	11,794	91,499	157,338	173,776
Italy	2,786	2,691	4,831	4,800	4,549	.	.
Netherlands	1,575	2,153	2,037	4,548	67	.	.
Norway	4,807	7,328	4,879	6,779	1,488	.	.
Portugal	6,038	5,411	874	5,358	4,748	3,181	2,461
Spain	1,362	364	2,918	10	6,911	1,171	50
Sweden	4,092	3,959	5,426	8,517	960	1,242	.
Canada	2	1	14	4	194	48	1
U.S.A.	5,311	4,482	5,842	7,378	18,020	22,765	15,359
Brazil	453	746	1,333	1,560	1,296	1,188	601

ports at the present time. Canada is third on the list. The Viking Way has reopened. The essentially European complexion of Iceland's trade is changing as an old geographical fact reasserts itself.

Export routes have changed likewise. While imports, despite their diversity, have always been derived from a few major sources: exports, simple in form, have always travelled diverse routes. In the 1920's, Spain was Iceland's chief market. In the mid thirties, Germany was principal market. Britain is, now, supremely important and, with it, Iceland has a very favorable balance of trade. The United States occupies a remote second place on the export list and neutral Portugal a more distant third. Though empires have tottered, the geography of commerce (and religion) still keeps alive the immemorial exchange between Iceland and Iberia.

Eight main Icelandic towns share most of the commerce. They are marked on Figure 1. From Table III, it will be observed that Reykjavik claims approximately 60 per cent of the total commerce. The other leading ports share 24 per cent between them; while some 60 smaller coastal settlements contribute the remaining 16 per cent. After the capital, Siglufjördur (Figure 5) has the greatest export trade and Akureyri (Figure 3), on the North Coast, the greatest import trade. Reykjavik commands the principal bight of the island—Faxafloi (Figures 6 and 7). Faxafloi—rich in fiord antechambers and tributary estuaries—has a southwestern aspect. Submarine contours reveal a natural channel which leads to Reykjavik and offers deep anchorage in its roads. In the evolution of the settlement, the circle of the sea—opening to the Atlantic approaches—and the coastal plainlands

FIGURE 8.—Greenhouse colonies flank the hot springs. Their chief wartime production is salad vegetables and fruit. Frost-free slopes to the streams carry crops of vegetables and small fruits.

—girdling most of the island—have played chief roles. Maritime foreground gives Reykjavik most favoured access to the North Atlantic. Its hinterland includes the longest occupied and most intensively cultivated part of the island. Upon Reykjavik's favoured promontary site is concentrated more than a third of Iceland's population. Port facilities have been improved by the presence of offshore islands; while, south of the capital is the accommodating defense base and supplementary harbour of Hafnarfjördur. More than any of the Scandinavian capitals, Reykjavik mirrors the economic life of the country. In 1942, 89 per cent of the island's international exchange was handled at the capital port. It is likely that it will become an even more important airport. Not vainly did the fickle waves in Saga times bring the pillars of Ingolf's high seat to Reykjanes.

Recession of Scandinavian forces in the face of broader Atlantic controls accords Iceland new opportunities but imposes new obligations. In coöperation with the forces which command the Atlantic regime, Iceland can claim fuller independence from its restrictive environment. Contrast the position of Finland for whom neighborhood to continental Russia relieves no physical obligations. First, geography unites Iceland to Great Britain. It is the logical northern extension of the British island system. Strategically, it covers the northern flank of the British Isles and is key to maritime domination in the North Atlantic and Arctic Ocean. Again, Iceland's physiognomy and simple domestic economy, resembling North Scotland and its related islands—are complementary to Britain's developed industrial regions, wealth of capital resources, infinitely varied trade, and shipping connections.

Secondly, the reality of North Atlantic community unites Iceland to North America. It is the European island most proximate to the Western hemisphere. As Finland is a continental springboard on the Russian foreground, Iceland is an ocean springboard on the Viking Way to America. Iceland has exported population to North America to become progressive elements north and south of the forty-ninth parallel. It has again entered into direct trans-Atlantic trade association. Icelandic Steamship Company's thousand ton North Sea boats have run on the North Atlantic supply routes. For the second time in its chronicle, Iceland has become foreground to the New World rather than a geographical background of the Old.

In Saga times, there was no reciprocal influence from the Americas to react upon the Norse population of the island. Now, as a foreground of American in-

FIGURE 9.—Farm Buildings are extensive. The new type, built from imported materials, contrasts with the old wood and turf structures.

terests, Iceland shares in the way of life of the New World. It has already skipped centuries in the progress which it has made over the last generation. Nor is the impact of the New World likely to retard this advance. Iceland, in the balance of America and Europe, is a study in centrifugal force. The country has always gravitated away from European authority. In all aspects of its life, it is likely to experience the repercussions of gravitation into the American field of interests. It emphasizes the renaissance as part of the broader tendency towards an all-inclusive community among Atlantic peoples.

PRODUCTION OF INDUSTRIAL QUEBRACHO

Dorothy C. Janis

CHIEF of all Latin American contributions to the tanning industry is quebracho, well known as a valuable tanning agent for only about 60 or 70 years, and widely used for only about half that time. It now occupies place in the front rank of tanning materials of the world's leather business. Its tanning properties so long known to local natives, were not discovered by the commercial world until the middle of the last century. Quebracho first made its appearance in Europe at the Paris Exposition in 1867, where its value was recognized and received wide attention; within a few years its use spread to tanneries of France, Switzerland, and Germany, although it was not until the late eighties and early nineties that large importation into Europe began. Exports of logs from Argentina first passed the million dollar mark in 1891, and since then has seldom fallen below that level.

South American Chaco Region

Gran Chaco ("great hunting grounds") the home of quebracho, is a region of many unnavigable, meandering streams, but by no means all wilderness. The northern part of the Chaco which produces abundant fine hardwoods is the center of the quebracho industry.

Quebracho grows throughout the Paraguayan Chaco, an area (nine and a half million acres) nearly one-fourth the size of Michigan, although only about 30 per cent of the total is continuous forest. The lush green vegetation of the Paraguay River banks is replaced westward by alternating thickets of thorny, deciduous scrub and openings of coarse grass. One of the chief species in the scrub forest is quebracho. The forests of the Argentine Chaco greater in extent than those of Paraguay, penetrate northward from Santiago del Estero, and westward from a number of places along the Rio Paraguay-Parana (Figure 1).

The Chaco subtropical climate is healthful and agreeable, for light, cool breezes blow from the south, even on the warmest days in summer and in winter, there is little frost and it never snows. In winter dry winds from Brazil frequently bring droughts to the Chaco. Climatic conditions restrict areal distribution of the trees. The best stands of timber grow where the temperature seldom goes above 105 degrees F. or drops below 32 degrees F.

Characteristics of Quebracho Habitat

Vast stretches of comparatively level lands make up the landscape; lands which drain away quickly enough so as not to keep the land under water, yet slowly enough to furnish the trees with sufficient moisture. The areas where quebracho grows best are flooded at times, but the water does not gather in stagnant pools as it does away from the drainage channels. Moisture requirements are exacting, for quebracho is rarely found at elevations 50 feet above the surrounding lowlands, and not on the slightly elevated lands (which get very dry), and in depressions of permanent swamps. Dense growth is

FIGURE 1.—Quebracho factories in the Chaco.

found only in places where ground water is strongly impregnated with salt, chiefly in the eastern part of the Chaco on the west side of the Paraguay-Parana River. The presence of salty streaks in the ground water of the Chaco has never been adequately explained, yet they seem to be responsible for the growth of this valuable tree. Thirty to 40 inches of rain fall in summer (November to April); and in winter, 20 to 30 inches. A forest of quebracho grows in eastern Bolivia, near the Paraguay River, but because of drought here, much less tanning material can be made from its trees than from those of the Paraguayan Chaco.

SPECIES AND THEIR USES

Quebracho (which takes its name from "queba hacha," axe breaker) includes several different woods of different families. The most important is quebracho colorado (*Quebrachia lorentizii*), the true tanning-producing form. Growing under exacting conditions described it is most abundant in the Chaco region from Santa Fe northward to southern Mato Grosso. It is hard, heavy, strong, durable wood, which weighs from 78 to 87 pounds per cubic foot, and excels for general construction, posts, ties, and cabinet work. It is most valuable, however, for its tannin of which it yields twice as much as hemlock. Tannin constitutes about 22 per cent of the substance of the tree. It takes the species 100 years to reach maturity; it lives about 150 years.

In addition to this true tannin quebracho, several other varieties are used, but they are less valuable or important. White quebracho, widely distributed in the Chaco and farther west, has large percentage of tannin in its foliage, but little in the bark, and is not exploited for its tannin content. It is not so hard or so heavy as red quebracho, but is strong and tough and makes excellent spokes and rims. Less durable than red quebracho, it is not so well suited for ties or posts. Its widest use is for fuel, although large amounts are used in construction. Stands of quebracho blanco, which grow in Chile, hold no interest for tanners, but have value in medicine, for their bark is used as a tonic, and as a respiratory stimulant in chronic bronchitis and pneumonia.

In the western part of the Chaco, another species is found with dark red wood, but which contains much less tannin than the true tanning quebracho. It is exploited along the railroad running northward, a little east of Santiago del Estero. In the treeless plains of Argentina it finds a variety of important uses, such as ties, telephone poles, fence posts, sleepers, firewood, and charcoal. Quebracho is adapted for use as ties in all parts of Argentina. Besides its suitable weight and hardness, it has the further advantage of not rotting when wet in the ground; it seems to petrify under water.

LUMBERING OF QUEBRACHO

There are three branches of business in quebracho industry: the original phase of exporting logs for manufacture of extract abroad; manufacture of extract in the quebracho region, with exportation of the finished product; and the production of structural timbers. Operations in the Chaco are in two phases: cutting and sawing timber and transporting logs (this being in the hands of contractors who supply all equipment and work on a tonnage basis), and manufacture and export of extract.

It is a tremendous task to move the heavy logs and make extract in a wilderness like the Chaco, so far from water, towns, and supplies. Tons of wood, machinery, building supplies, and sawmills and other buildings must be put up; and camps built for workmen and their families. Because of the amount of labor and great expense involved, the work is undertaken only by large companies.

Fortunately, trees are distributed within short distance of rivers, so that the plants are on river banks. The industry labors under several handicaps. Land transportation is poor. In the extremities of wet or dry weather, the land is flooded in the rainy season, or there is a scarcity of water for pasture for stock in the dry season. The insect problem, especially mosquitoes and sand fleas must be considered and solved.

Quebracho lumbering in the semitropics is far different from the great logging operations of our Pacific Northwest. Building railroads into timbered regions is difficult. The land is flat; there is no gravel or stone for roadbeds. In rainy seasons tracks are apt to slip about or sink in the earth. At the ends of lumber railroads, roads are built in different directions for bringing in the quebracho logs. The forest cutting zone is restricted to an area less than ten miles wide on either side of the tracks. Beyond the cutting zone, the Chaco remains wilderness. After the trees are felled, the bark and a layer of sapwood are stripped off, for the quebracho carries its tannin in the heart of the trunk instead of in the bark. After the trees are stripped of their outer bark, the private mark of the owner is stamped with paint on each log which is then slung between low wheels and drawn by oxen out of the forest. The branches and twigs on the trees are saved to provide fuel for the locomotives as this is a land of no coal. Often one log is a heavy load for several oxen. Because of hard work and heat, the animals have to be carefully fed and tended to keep them in good health. They can be used only half a day or a day at a time. Then they are turned out to graze and rest for an equal length of time.

The wood is one of the toughest and heaviest known. A single log weighs five tons or more. Because of their great density quebracho logs will not float in water, but have to be carried down the rivers on rafts built of lighter wood or on boats. A major problem is shipping the logs to mills. Great volume of water is required, so mills are located near the Parana itself, or in a zone 30 to 60 miles wide in which there are tributaries to the Parana. Inland from this zone of tributaries, only four large rivers cross the Chaco, and only in their floodplains can surface water be found with any certainty.

An obstacle facing the industry is the uncertain labor situation and frequently recurrent insurrections. Labor is plentiful, but irresponsible. Only a handful of immigrant colonists have started ranches and farms, leaving most of the Chaco uninhabited. As has been

said before, logging is done by large contractors who hire their own Indian axemen and, with their families, live where they work.

Factories are restricted to a strip near the Parana and Paraguay Rivers. Labor for the factories comes from Corrientes across the Parana, while the less attractive sawmill enterprises of Santiago del Estero must recruit all of their working force from the interior agricultural districts. Living standards for all laborers are low. The skilled laborer receives a wage of $1.50 a day. Such a wage to a North American would seem low; for a South American laborer it is high.

THE EXTRACTING INDUSTRY

In the early days of the quebracho industry logs were exported to the United States and Europe where tanning extract was made. This is still done to some extent, but in the Chaco large plants have now been built in which thousands of tons of extract are prepared. Quebracho at the present time, is being prepared in small portable mills in forests along the Paraguay-Parana.

A single tree weighing a ton yields 600 pounds of extract, enough to tan as much leather as almost twice the quantity of oak bark; the growing of a comparable amount of oak bark tannin takes about half an acre of land. The best and cheapest tanning material, quebracho, gives leather a fine color which cannot be secured from any other known material. Chief quebracho factories are situated at Puertos Galileo, Casado, Sastre, and Max and Maria. Each factory is supplied by a light railroad for the transportation of timber which goes either to the factories for the purposes of tannin extraction, or to one of the small river ports to be shipped abroad. These light railroads play a leading part in development of the Chaco.

The quebracho industry of the interior belongs to a number of small capitalists, who divide log purchase into small quantities. In contrast, the tannin acid factories of Eastern Chaco are large permanent establishments, importing quantities of logs from long distances. Abundance of fresh underground water (the principal requirement for the preparation of extract), and cheap shipping facilities on the rivers restrict sites of the factories to a strip near the Parana and Paraguay. For the most part the plants are run by corporations. Extract corporations depend upon their own vast timber holdings for a large proportion of raw materials, but may purchase logs in the open market from small private organizations at times when they find it difficult to supply the factories from their own holdings. In the process of extraction, tannin is produced from the heartwood of the trees.

Skins must be tanned to stop decomposition, to give the hides greater strength, pliability, and toughness. By the use of quebracho extract, the tanning process is shortened by several months, which was of special value in the manufacture of shoes for our Army during the First World War.

At present only the heartwood is used, which yields 25 to 30 per cent tannin. Sapwood (three to four per cent tannin) and bark (six to eight per cent) are discarded, but as the timber becomes less plentiful they will be used. The bark is nearly as rich in tannin as oak bark. It takes about five tons of logs to make one ton of extract, containing about 65 per cent tannin. In its average tannin content of from 62 to 68 per cent, quebracho tops all others. It is sold under a guaranty of 63-67 per cent and this standard is said to be well maintained.

Because of the extreme hardness of the wood, special chipping machines grind it into a coarse sawdust which is carried by conveyors to the extractor chamber. Steam, under high pressure, is played upon it, making a heavy liquor which runs into an evaporator. A bisulphide is added and the wet dull red cake of resinous crystalline form. This is shipped in bags and casks to Buenos Aires and other Plata River ports for export. It is estimated the Argentine factories can turn out 500,000 tons of extract a year.

The Tariff Commission reports that quebracho has several advantages when compared with other tannins. Quebracho extracts are marketed as a black brittle solid of 65 per cent tannin content and as liquid extract. Solid extract is shipped in bags and casks, while liquid is shipped in barrels and tank cans. It acts quickly and thoroughly, giving leather good strength, toughness, and firm feel, and produces a more mellow leather than bark tannage, forming a good grain in a shorter time. Quebracho is seldom used alone; for best results are obtained by combining it with other tannages, as chestnut, oak bark, hemlock, or mangrove. The combination with chestnut is of great importance and extensively used. One reason for using quebracho in combination with other extracts is the low content of fermentable nontannin matter which produces acid fermentation. Quebracho also gives excellent results when combined with oak. It differs from hemlock and oak in that when used alone it will not produce the best grain of leather. Such an addition does no harm in the case of soft leathers, but would probably be injurious in sole leather tannage. Chief advantages of quebracho over other tannins lie in its cheapness and the promptness with which it acts.

DISCOVERY OF TANNIN IN QUEBRACHO

The important discovery of tannin extract, to which the development of South American industry owes so much, was made by two Italian chemists, Lepetit and Taglianai. Quebracho contains a considerable quantity of difficult soluble tannin. They discovered, after long experimentation, that sulphurous salts of alkali metals such as sodium sulphite, would dissolve reds of quebracho extract so as to keep them soluble not only in cold water, but in acid liquids of a tannin vat. They found also that these salts so acted on soluble tannins of quebracho extract as to prevent their precipitation in sour liquids. It was further found that by treating quebracho extract with sodium bisulphite or other sulphites under suitable conditions all loss of soluble tannins was avoided and all insoluble or difficult soluble tannins were made available by solution. Application of this discovery to quebracho extract eliminated all its objectionable properties; made its use possible under all tanning extracts, thereby adding fully 25 per cent to its value by saving and utilizing the tannin which had previously been precipitated and thrown away. In fact, one might say, this discovery could be classed as one of the most important ever made affecting the leather industry.

The discovery led to the taking out of two English patents in 1898 by Lepetit, Dolffus, and Gansser. By these first patents, quebracho and other extracts were rendered soluble by heating in closed vessels with bisulphites, sulphites, sulphides, or even caustic alkalis, and many "soluble quebracho extracts" made on this principle are now on the market. Another method of dissolving, which is more suitable for the treatment of extract and has been patented in England and the

United States is by treating with aluminum sulphate and then with sodium bisulphite.

VENTURE IN THE WILDERNESS

Millions of dollars are invested in the quebracho industry, and one of the largest interests is that of the International Products Company. In 1918, after taking over the holdings of the New York and Paraguay Company, it established another factory at Puerto Pinasco. It owns vast areas of forest on both sides of the river. It has about 50 miles of railroad line running into its holdings, and its own steamers carry its products to Buenos Aires and Montevideo. The extract exported from these ports go largely to the United States, although England, France, and Germany are also important customers.

The establishment of Puerto Pinasco mentioned in the above paragraph has an interesting history. It was begun by International Products Company who asked G. Kerr to help in a plan that involved wresting the quebracho industry from Germany. With higher cost of production and of quebracho and vanishing of American chestnut, quebracho was the wood most widely used for vegetable tannin. Previously, logs were sent to the United States and Europe, and there ground. The new plan was to use a forest concession costing two million dollars and to put up a plant at the wood source.

Kerr went up the river from Asuncion. The captain of his boat obtained workmen for him at the pirate ports of Suarez and Marinho. He had to find work for his men while waiting for the machinery to arrive. Encountering difficulties all along the way, the building, which when completed stood 75 feet high with chimney stack 125 feet, slowly rose in the clearing. When the machinery was put in place, the roof was put on. Next, the problem was to get in quebracho wood to feed the plant. To do this, he had to build a railroad reaching back 60 miles into the forest. Kerr named this settlement Puerto Pinasco.

It was a factory built in the wilderness. With bandits and savages for workmen, a huge quebracho extract plant was built in the heart of the forest of Paraguay. In nine months Kerr built a dock, an iron and brass foundry, a huge carpenter shop, made seven million bricks, laid a railroad line 60 miles long, rigged up 200 new oxcarts, and then built a plant covering two acres, which turned out 70 to 80 tons of quebracho liquid daily.

MONOPOLY OF THE INDUSTRY

Present-day problems of the industry concern the breaking up of an alleged monopoly. Dissolution was sought; civil action has been instituted in an attempt by the government actually to dissolve the alleged combination following criminal action in 1943.

The Tannin Corporation and the International Products Corporation are the official agents of the pool in the United States. Tannin Corporation imports about 70 per cent of all that is brought into the United States. It is owned by St. Helen's, Ltd., of Canada, which is controlled by Forestal of England. There are 22 quebracho producers in Argentina and Paraguay. All but four belong to the cartel, and the four industries produce only 11 per cent of the total. The five biggest companies that account for 57 per cent are controlled by Forestal. Larger demands and increased profits caused dissension among some quebracho growers who threatened to exceed their cartel-dictated quota. Prices were $.025 a pound in 1934, but went up to $.0478

by January, 1941. Shipping space was denied; Forestal controlled steamship lines. Substitutes were sought, but as long as quebracho extract was available at a price which the tanning industry could pay, these other possible sources of tannin were not commercially developed.

POSITION IN WORLD TRADE

Slightly more than a quarter of a century old, the quebracho industry has developed at a rapid rate. Annual exploitation is more than a million tons of quebracho logs cut from 500,000 acres. Ninety-eight per cent of the quebracho tannin is produced in Argentina and Paraguay, and in 1942 the total of 300,000 metric tons was valued at $25,000,000. The normal world-wide consumption of quebracho extracts is at the rate of 250,000 tons annually.

Quebracho was first introduced into Europe as tanning material in 1867, and its use on a large scale commenced in 1888, especially in Germany. Manufacture of quebracho extract in Argentina and Paraguay began in 1889 and, is now second in importance among Argentine manufacturing industries. It was greatly stimulated after 1913 by the high ocean freight on logs, which made it more economical to export the extract. Since 1913, exports of logs decreased steadily. United States takes the largest share of logs. Exports of posts, short poles, and stakes, most of which go to Uruguay are of considerable importance. About 80 per cent of quebracho extract used in the United States comes from the Argentine; nearly 20 per cent from Paraguay.

Importance of quebracho is seen in the fact that since 1924, shipments of quebracho extract measured in tannin units, average more than two-thirds of the total volume of international movement in tanning agents.

OUTLOOK FOR THE INDUSTRY

As a whole, the industry has an estimated life of 40 years. This does not take into account the use of lower and lower grade material as tannin extract becomes more expensive.

A progressive forest policy may lengthen the life of the industry, but no attempts have been made to reforest because 100 years are required to bring the trees to maturity, and this has seemed too long a time to investors.

BOOK REVIEWS

VAN CLEEF, EUGENE. *Geography for the Businessman.* Harper & Brothers, New York and London, 1943. Price $2.75.

Any book for a business man must be brief, clear, direct, compact, and useful. The business man does not have time in his business to pore over voluminous treatments of any subject, beyond the necessities of the problems that he has to solve. However much time he may have for leisure outside his business, he does not wish to devote it to the solution of the daily routine problems that he has to face. He likes to have his facts and his explanations set down as simply and plainly as possible, that he may appraise and comprehend their significance at a glance. He is impatient with indirectness, circumlocution and detail.

Apparently Eugene Van Cleef, in this book for the business man, has fully realized the limitations of time and effort that the business man can devote to the application of geographic principles to the production of goods or their distribution and marketing. It is a relatively small volume, excellently organized, and succinctly written. All extraneous matter is carefully eliminated and all unnecessary detail is deleted; yet there is no omission or confusing concentration to detract from the force and clarity of the work.

Titles of the various chapters in almost every case reveal how throughly the author has appreciated the problem of presenting his material satisfactorily; for instance, the first chapter is entitled "Maps and Markets" and explains how maps can be applied to problems of distribution and transportation particularly; Chapter 7 is entitled "In the Language of the Earth—Advertising"; Chapter 11 entitled "Conflict with Nature—Price Control"; Chapter 14 entitled "Man Struggle for Survival—International Stability." Such titles indicate the theme upon which the chapter is built. The whole book is organized in a logical and convincing way, to lead the business man from one problem to another, or from one factor in his problem to the next, until he sees clearly how geography may aid him in achieving his aims.

And it is not only in its practical application to the problems of business that the book is valuable. The business man who reads it for its practical use can not help absorbing some of its interesting and educational significance. To a considerable degree he masters the fundamentals of geographic discipline, that is, he learns to orient his thinking in terms and along lines of place, or location. He comes to appreciate the importance of geographic facts, and the soundness of geographic interpretation. He comes to realize how essential it is to know something of modern geography, how important it is in exploring man's adaptations to his environment wherever he may be, and how great its cultural value is for the school curriculum and for training in citizenship.

In many ways Van Cleef's modest little book makes an important contribution to the literature of geography. Besides being a reference book for the business man particularly, it may well serve as an excellent textbook in business courses in colleges of commerce, and in strictly business colleges as well. It should have very wide use throughout the country. In its form (binding, paper, type, etc.), in its textual matter, and in its practical point of view, it fills a place that has long been open in the education field of this country.

W. E. E.

GREITZER, SAMUEL L. *Elementary Topography and Map Reading.* McGraw-Hill Book Co., Inc., New York, 1944. Price $1.60.

OLSON, EVERETT C. and WHITMARSH, AGNES. *Foreign Maps.* Harper Brothers, New York, 1944. Price $4.00.

LOBECK, A. K. and TELLINGTON, WENTWORTH J. *Military Maps and Air Photographs.* McGraw-Hill Book Company, Inc., New York, 1944. Price $3.50.

LORD, CLIFFORD L., and ELIZABETH H. *Historical Atlas of the United States.* Henry Holt and Co., New York, 1944. Price $1.75.

RAISZ, ERWIN. *Atlas of Global Geography.* Harper and Brothers, New York, 1944. Price $3.50.

CAMPOS, CARLOS AUGUSTO RIBIERO. *Atlas Estatistico do Brasil.* Deparmtento Nacional do Cafe, Rio de Janiero, 1941.

As the author of "Elementary Topography and Map Reading" states in the first sentence of his preface: "Maps constitute an important educational tool. Their usefulness has long been recognized in the study of civics, history, geography, and economics, but they are playing an increasingly important part in the extended and enriched curriculums now being developed. They are, for example, being introduced to a greater extent in the study of literature, mathematics, and foreign languages."

He succeeds very well indeed in stating the problems of map making, relating mathematics to map reading, and in explaining and elucidating the way in which the surface of the earth has been mapped, the use of topographic maps, and other applications of maps to economic, political, and military purposes. His concluding chapter "Aerial Photographs and Special Helps" is too brief to be satisfactory or of much value to the student or as a reference.

On the whole, however, this little book by a high school instructor in mathematics measures up very well indeed to the need for an elementary or introductory text in the subject of maps.

In "Foreign Maps" by Everett C. Olson of the Department of Geology in the University of Chicago and Agnes Whitmarsh, librarian in the map library in the University of Chicago, the authors have made a most worthy contribution to the literature of cartography. It forms a compendium of the chief types and sets of maps available from the many countries of the world and a guide to the system by which they may be read, indexed, and interpreted. In addition it includes three chapters that deal with signs and symbols, scales and measurements, and grid systems. Altogether it is a most valuable reference for geographers, and particularly cartographers.

"Military Maps and Air Photographs: Their Use and Interpretation" is a comprehensive treatise on map reading with particular emphasis upon topographic mapping by hachures, contours, various types of graphs, and aerial topography and plotting. The text, as the authors state is designed as a basis for a course of instruction and as a reference book for topographic draftsmen.

Because simple concise directions for compiling various kinds of maps form part of the text the need is eliminated for a large amount of desk instruction by the teacher. The use of various kinds of equipment and materials is demonstrated and explained. The book contains the most complete set of topographic symbols yet published within the covers of one text, and thus becomes a valuable reference book for all map draftsmen. As the authors state in their preface, using maps expertly is essentially the application of common sense backed by experience. The authors form a team that insures the effectiveness of the techniques and methods described.

"The Historical Atlas of the United States" is a step in the right direction, another step toward the correlation between geographic discipline and historical discipline. The increasing use of maps which have so long been chiefly the geographers' tool, by historians and economists indicates a growing appreciation of the value and function of maps in interpretation of phenomena with which other sciences besides geography are concerned. This historical atlas emphasizes economic, demographic, social, and other elements even more than strictly political considerations as so many historical atlases do. It is an exceedingly valuable reference book for many if not all of the so-called social sciences.

Edwin Raisz in his new and striking "Atlas of Global Geography" has achieved success in the graphic presentation of areal data that is both outstanding and well earned. Of all the recent publications in cartography, or of cartographic interest this latest from Raisz's workshop is the most valuable and important. It presents more clearly, distinctively, and emphatically the significant areal facts of geography than do any other similar publications. It should be on every geographer's reference shelf.

A veritable compendium of geographical information about Brazil, the character of its terrain, its political and administrative districts, its climate and soils and waters, its demography, its resources, its activities, and its production and trade the "Atlas Estatistico do Brasil" includes such a vast amount of statistical and other material about Brazil that it can truthfully be said to be a cartographic encyclopedia of Brazilian political, economic, and social development. Unfortunately the atlas is bound in board, and consequently is not likely to prove very endurable as a reference volume. However, to the geographer interested in Brazil or in South America the book is sure to prove exceedingly valuable.

W. E. E.

GEORGE B. CRESSEY. *Asia's Lands and Peoples.* McGraw-Hill Book Company, New York City, 1944.

"Asia's Lands and Peoples," a teachable text, should be known by every teacher of geography. Regional in organization and approach, the material is well-organized, clearly presented, and carefully balanced from the point of social significance.

China and Japan, the Soviet Union, Southwestern Asia, India, and Southeastern Asia constitute the five major realms of Asia. These in turn are divided into provinces (22 in all) of such magnitude as North China, Soviet Siberia, Peninsular India, and the like. The provinces in turn are the products of 94 geographic regions such as the Yellow Plain, Szechwan Basin, Hokkaido, White Russia, Indus Valley, and many others both cultural and natural. The logical dominant characteristic is the basis for the selection of each type of area.

Two good chapters, one on the significance of the Pacific Basin and the other on the broad aspects of the continent of Asia orient the reader. The opening statement, "The Pacific is a whale of an ocean," may well become a byword in Pacific affairs. For the rest of the book, which presents the major realms, a parallel pattern of presentation is maintained. China and Japan, as separate nations, come first followed by the Soviet Union. Human, cultural, and natural environmental conditions of general application to the realms are presented first after which the details of the regions are developed.

The five chapters devoted to India are somewhat less than the traditional amount. The treatment, however, seems to be quite adequate and justifiable from the point of view of the significance of India. On the other hand, the Soviet Union receives much more than the customary attention (seven chapters). In places the treatment of the Soviet realm becomes somewhat encyclopedic.

Although the book lacks a single large-scale map depicting the realms, provinces, and regions, numerous maps are well placed throughout the text. Three map scales, 1:75,000,000 for the continent as a whole, 1:30,000,000 for the realms, and 1:2,000,000 for urban areas, and a single azimuthal equal distance projection have been used; thus the maps of like scale may be fitted together. The geographic regions are drawn on a physiographic base map. All photo-

graphs and drawings in the book are available in lantern slides.

University of Illinois JOHN H. GARLAND

ULLMAN, EDWARD L. *Mobile: Industrial Seaport and Trade Center.* University of Chicago, Chicago, Illinois, 1943.

As a study of one of the important Gulf ports of the United States "Mobile: Industrial Seaport and Trade Center" is another valuable contribution to our growing specialized geographic literature. It constitutes a dissertation submitted to the faculty of the Division of Physical Sciences of the University of Chicago as one of the requirements for the degree of Doctor of Philosophy, published in 1943, and submitted to the Department of Geography in 1942.

Valuable as these minute studies and theses are because of their exhaustiveness and contribution to current geographic philosophy and interpretation, it seems inevitable that their ultimate value will be chiefly historical. In the course of a quarter century, or perhaps even less the material of which they are composed will have become obsolete as geography, and their place in the literature will depend upon their value as historical sources.

W. E. E.

CAIN, STANLEY A. *Foundations of Plant Geography.* Harper Brothers, New York, 1944.

"Foundations of Plant Geography" is a scholarly and thorough work by an able and conscientious research investigator. It enters a field in which there has been practically no authoritative compilation and evaluation of much significant material that has been published chiefly as magazine articles for the last quarter century or more, and because of this fact would be a valuable addition even if the author had not contributed so much of his own original study and investigation. There is no question that he has accomplished a vast amount of painstaking work in the evaluation of the results published by other research workers; and there is likewise no question that he has achieved even more noteworthy results in the original and compact way in which he has organized and integrated all these diverse contributions.

The result is eminently satisfactory; but it must be remarked that while it is a brilliant exposition of "Plant Geography as a Borderline Science" it is at such a high level that only the most advanced graduate students in the fields of botany and geography would be able to use it intelligently and satisfactorily. It deals with subjects in which very few undergraduate students have achieved a competence to appreciate the meaning and significance of the material which the book covers. It would be an advanced geographer indeed who could make use of the material in such a chapter as "Geographical Aspects of Polyploidy" or "Species Senescence." Even though, by his introductory chapter the author states that plant geography is a borderline science, the material of the book clearly indicates that its field is primarily botanical, and in that field largely genetic. It would seem to be no misstatement to say that the book is dominantly botanical, in very slight degree geographic. A specialist in the genetic phases of botany would have no difficulty in understanding "Polyploidy and Phylogenetic Relationships" but even a specialist in geography would probably find himself pretty deeply submerged in unfamiliar terminology and philosophy.

Despite its very distinct botanical flavor it does have significance for the geographer, and particularly the geographer who is interested in vegetation, its distribution, and the reasons for its character and distribution. A plant geography for the geographer remains yet to be written; until it appears "Foundations of Plant Geography" will have a definite place on the professional geographer's reference shelf.

W. E. E.

PETTY, JULIAN J. *The Growth and Distribution of Population in South Carolina,* Bulletin No. 11, Prepared for South Carolina State Planning Board. Published by State Council for Defense, Industrial Development Committee, Columbia, S. C., July 1943.

Organized and written in complete conformity with orthodox geographic technique, "The Growth and Distribution of Population in South Carolina" constitutes one more valuable addition to the demographic literature of our country. It opens with a relatively brief and compact survey of the physical characteristics of the state, satisfactory so far as it goes. This introductory foundation for the volume is followed by an equally brief account of the Indian population, brief because so very little is accurately and definitely known about either the density or distribution of the aborigines in the territory now embraced within the state. The third chapter devoted to the royal government period is somewhat more comprehensive and more interpretative than the first two chapters. With these somewhat vague and indefinite chapters disposed of as well as the information and knowledge available permits, the author enters upon the national period of our country in five chapters, discusses the redistribution of population in two more, and finally analyses his conclusions in the eleventh chapter. He concludes with a bibliography and eight appendices. As a demographic treatise on South Carolina, it will ever remain an important source work. Its current geographic value is significant, and as it declines its historical value will proportionately increase. Its continued value lies in its compilation and graphic presentation of a vast amount of material that might be lost had it not been preserved in this excellent monograph.

W. E. E.

STILGENBAUER, FLOYD A. *Certificated Airline Map of the World.* Wayne University Press, 1944, Detroit, Michigan. The base in black, 35 cents; the base with airlines in red, 65 cents; the four color, $1.25 in paper, and $4.50 mounted.

Convenient for every student of future air transportation, this map, developed by Air Cargo Research, Wayne University, Detroit, Michigan, is a valuable addition to the cartography of modern global economic problems. The polar lobate globoid projection used for the map "achieves a new maximum for accuracy in shape, position, and area of continent, and yet preserves the essential globe-like or spherical character of the world. Distances and directions of airlines and other significant geographical features are displayed with minimum inaccuracy," according to the makers of the map, Spencer A. Larsen, director and professor of business administration, and Floyd A. Stilgenbauer, cartographer and associate professor of geography. It appears to be a valuable contribution to current map literature.—W. E. E.

ECONOMIC GEOGRAPHY

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The January issue of Volume 21 contains the following articles:

Cement Plant Migration in Michigan, Paul Cross Morrison, Michigan State College.
Water Supply of the Incorporated Towns and Villages without Organized Systems, J. R. Schwendeman, University of Kentucky, Lexington, Kentucky.
Population of Southern Utah, Herbert E. Gregory, United States Geological Survey, Washington, D. C.
The Tobacco Belt of North Carolina, Franklin C. Erickson, University of North Carolina.
The Railway Terminal Problem of Central Chicago, Harold M. Mayer, Chicago Plan Commission, Chicago, Illinois.

The October issue of Volume 20 includes:

The Aluminum Industry of the Western Hemisphere, James E. Collier, University of Missouri, Columbus, Missouri.
Water Supply Geography of the Basin of the Red River of the North in the United States, J. R. Schwendeman, University of Kentucky, Lexington, Kentucky.
Storms of the World, Stephen S. Visher, Indiana University, Bloomington, Indiana.
Agricultural Economy of the Laguna Region, Lorene A. Garloch, University of Pittsburgh, Pittsburgh, Pennsylvania.

The July issue includes:

Water Supply Geography of the Basin of the Red River of the North in the United States, J. R. Schwendeman, University of Kentucky, Lexington, Kentucky.
British Railways and Motor Roads in the Middle East—1930–1940, Morton B. Stratton. Denison University, Granville, Ohio
High Country "Run." The Geography of Extensive Pastoralism in New Zealand, K. B. Cumberland, Canterbury University College, Christchurch, New Zealand.
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